CAIS STANDARD MANUAL

SYSTEM NO. 6
BUILDING
CONVEYING SYSTEMS

CAS PROJECT
CAIS MANUAL

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MEMORANDUM FOR DTIC-OCP
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FROM: AL/EQ (STINFO)
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SUBJECT: Transmision of Technical Documents

1. As per telephone conversation with Andrew Poulis, EQ/TIC, the attached CAIS CTDS manuals are forwarded for accession, cataloging, and microconversions. Please forward the accession numbers to:

Andrew Poulis
AL/EQ/TIC
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Tyndall AFB, FL 32403-5323

2. The Distribution statement should read as follows: Approved for Public Release: Distribution Unlimited.

3. If you have questions about these documents, please contact Andrew Poulis at DSN 523-6285.

Larry L. Testerman
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Scientific and Technical
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Atchs: Manuals

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ABSTRACT

GENERAL ORGANIZATION

At this installation the list of facilities to be surveyed, including infrastructure, will be addressed on the basis of 32 unique systems that form the CAIS Engineering Deficiency Standards and Inspection Methods document. Each system deals with a specific technical aspect of the facility to be surveyed. Within each system a further breakdown is made to subsystems, each having a related list of components. Detailed observations of the listed defects are provided so as to allow the entry of observed quantification data. A DOD CAIS manual is provided for each of the 32 systems with an internal organization as outlined below:

INSPECTOR'S GUIDE

I. General
   A. Level I Inspection Method Description
   B. Level II Inspection Method Description
   C. Level III Inspection Method Description

II. General Inspection
   A. Process. This section describes the process of the inspection activity.
   B. Location. This section describes the procedure for locating the inspection units in the facility or infrastructure on this installation.

III. Inspector Qualifications
   This section notes the minimum qualifications for the person or persons performing the survey.

IV. Inspection Unit
   This section describes how the IU (Inspection Unit) is determined for the particular component being surveyed.

V. Unit Costs
   This section notes the nature of repair costs for this system.

VI. Standard Safety Requirements
   This section lists safety procedures and equipment required to implement a safe environment for the conduct of this survey.

VII. Standard Tools
   This section lists a set of standard tools required for the general conduct of this survey.

VIII. Special Tools and Equipment Requirements
   This section refers to special tools or equipment requirements endemic to the nature of the system being surveyed.

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IX. Level II Inspection Method Keys
This section explains and locates Level II Key sheets.

X. Level III Inspection Method Keys
This section explains and locates Level III Key sheets.

XI. Repair/Replacement Cost
This section describes the nature and location of replacement cost data.

XII. Appendices
Appendix A. Provides a summary and definition of all abbreviations used both in the Standards and in the data base.

Appendix B. Provides a glossary of terms with their definitions as used in the Standard.

Appendix C. This section contains a listing of the average life cycle durations for each assembly* in the Standard.

* Assembly is a term describing the level at which replacement rather than repair occurs. This can be at the subsystem or component designation, depending on the system being surveyed.

SYSTEM TREE

The System Tree is a graphical representation of the Work Breakdown Structure, showing system, subsystem and component relationships for the Building Conveying System.

INSPECTION METHODS

Description
Describes the nature of what is to be condition surveyed.

Special Tool and Equipment Requirements
Lists any special tools required for this specific subsystem.

Special Safety Requirements
This section outlines any special safety measures or equipment required for this specific subsystem so as to maintain a safe environment and process in the conduct of the condition survey.

Component List
All components to be surveyed under this subsystem are listed here.

Related Subsystems
All other subsystems that have a survey relationship to this subsystem are listed here to help coordinate a complete and thorough condition assessment survey.

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Standard Inspection Procedure

This statement indicates the various levels of survey effort required for this subsystem.

Components

The previously listed components of this subsystem are described with a survey procedure recommended on a component by component basis. For each component there is a listing of defects with each defect broken down into observations describing the nature and severity of the defective condition observed. The surveyor enters a quantification value for each defect/observation encountered in the field CAIS device (DCD) to record the result of his survey.

References

This page lists the reference sources from which the foregoing subsystem data was developed.

Guide Sheet Control Number

This section lists the key numbers that tie the written Level II and Level III guide sheets to specific components in this subsystem.

Level II and Level III Inspection Method Guide Sheets

This section contains the detailed descriptions of the Level II and III survey and inspection procedures for this subsystem.

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INSPECTOR'S GUIDE

I. GENERAL

"Inspection" implies specific legal meaning for certain Building Conveying Systems . Even though the CAIS observations may duplicate some actions required of other inspectors, this inspection will not take the place of life safety inspections required by code or regulation or of regular inspections conducted as good maintenance practice. The Facility Manager's responsibility to conduct periodic inspections to meet code or regulation or to insure good equipment maintenance remains.

A. Level I Inspection Method

The Level I Inspection Method of Building Conveying Systems consists of a thorough inspection of each component present in the facility based on the defects and observations present in the subsystems and components that follow. The Level I Inspection Method is a walkby inspection with notation and recording of system and component defects. It relies on a primarily visual inspection and is designed to be performed by one inspector. Some interaction with user personnel may be necessary to ascertain the functionality of various systems.

B. Level II Inspection Method

The Building Conveying System employs a number of Level II Inspection Methods to ascertain whether visually identifiable defects impede the operation of a device. Level II Inspection Methods also provide for walkby inspection of components that are behind locked doors, panels, or other covers or; that by their nature, must be opened to be inspected. These requirements are defined within each component as Level II Keys resulting from specific defect/observations. The standard Level II inspection is designed to be performed by one person.

C. Level III Inspection Method

Several Level III Inspection Methods are identified for use due to a Level I or II "trigger" or based on a cyclical inspection requirement. Due to the wide range of mechanical components present in Building Conveying Systems, a number of Level III Inspection Methods are provided to provide guidance in the execution of a more detailed analysis. Guide Sheets for these inspections are included at the conclusion of each subsystem.

II. GENERAL INSPECTION

A. Process

The inspection is normally conducted at the component level. Figure 6-A provides the breakdown from system through component for Building Conveying Systems.

The inspector will work through the Work Breakdown Structure (WBS) to conduct the inspection. At the component level the inspector will be provided a list of defects,

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each of which is described further as observations. These observations are described to various levels of severity as they relate to the effect on the life of the system. The quantification of each deficiency is identified by the inspector using the associated unit of measure. Once an observation is populated with a deficient quantity, the inspector will be requested to provide information on component type and location. The installation date or age of the component may be preloaded into the WBS for each asset from the Real Property Inventory List or site specific information. This can be overridden by the inspector, Site CAIS personnel, or Facility Manager.

B. Location

Level I and II inspections will be located by the inspector through a discrete entry into the Data Collection Device. The "IU" or component location will be derived from Facility-supplied segment numbering lists, maps or other I.D. numbering systems. For building associated "IU's" and components the Facility shall furnish plans annotated with room number schedules. In the case of non-room associated components, plans will be orientated with the top of each sheet being the north direction, so as to allow directional location and description. In the case where no maps, or plans are available the inspector shall enter a brief (65 character) description of location.

III. INSPECTOR QUALIFICATIONS

Minimum inspector qualifications for Building Conveying Systems require a five-year journeyman. An emphasis in the areas of mechanical systems and conveying is desirable but not required. All of the inspection requirements for this system can be performed by a single inspector, however, safety and other considerations may require inspectors to work in teams.

IV. INSPECTION UNIT (IU)

The inspection unit (IU) is defined at the component level. If the unit of measure at the component level is "each", then the IU is "each" (e.g., Motor). If the unit of measure is "square feet", the IU is determined by the identification of location and the IU quantity is the total area of that component that exists at that location (e.g., 15 square feet of belt coating or cover on conveyor No. XXX).

IU's may be one occurrence of a component (e.g., a motor) or multiple occurrence of a single component (e.g., multiple Supports/Anchors on a single Pneumatic Tube Assembly). Defect quantities are recorded by the inspector for each observed occurrence within the discrete component (deficiency quantities are tied to each Supports/Anchor as a discrete component, but the component "Control Center" may have only one discrete unit since it is a single system).

For Example:

> The inspector locates 4 LF of a damaged Tubing and Tube Fittings on a Pneumatic Tube Assembly. This quantity is recorded in the field CAIS for the component "Tubing and Tube Fittings" located by the IU defined at the

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component level as "Tubing and Tube Fittings." As the inspection continues on the IU, the inspector finds another 2 LF of damage. The observation is edited from 4 LF to 6 LF since it is the same defect/observation and discrete component. This can be summarized as the total quantity of deficient Tubing and Tube Fittings, 6 LF for the component "Tubing and Tube Fittings" and the subsystem "Pneumatic Tube Assembly."

For the above example, an occurrence is defined as a defect (or observation) which is detected within the inspector's line of vision. If the inspector has multiple defects (or observations) in an occurrence within the same discrete component, the inspector will quantify the observation that is considered most severe and identify the remaining quantity under the less severe observation for the discrete component.

For Example:

15 LF of Tubing and Tube Fittings is loose, but within that 15 LF, 4 LF is missing. The inspector will quantify 4 LF under the observation "missing tubing" and 11 LF under the observation "loose tubing/tube fitting," for the defect "Physical Damage."

V. UNIT COSTS

The unit costs that are applied to the quantities recorded for each observation are contained within the Site CAIS as repair cost.

VI. STANDARD SAFETY REQUIREMENTS

The Master Safety Plan will be followed at all times during the inspections.

Prior to inspection of the Building Conveying Systems, the authority (Facility Manager) having jurisdiction shall be notified to secure proper access, safety briefings, and personal safety items.

While inspecting Building Conveying Systems components:

- Use approved tag-out procedures to prevent inadvertent operation of rotating equipment during inspection activities. The equipment should be locked out at the main control panel when possible.
- Be aware of adjacent operating or rotating machinery. Do not defeat safety interlocks, machinery guards, or other automatic or passive safety devices.
- Do not inspect electrical components in a wet environment while wearing wet clothing.
- Do not wear loose clothing (unbuttoned sleeves, ties, open jacket, etc.) during the inspection.

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VII. STANDARD TOOLS

Employee Identification Card - to be worn or carried during all inspections
Data Collection Device
Battery pack for Data Collection Device
Flashlight
Tape measure - 50'
Rule - 6'
Tool bag
Small metal mirror
Screwdrivers -
- Phillips
- Straight slot

Knife
Infrared Scanner - Raytek, Inc., #PM2EM-L2

VIII. SPECIAL TOOLS AND EQUIPMENT REQUIREMENTS

At subsystem level within Building Conveying Systems, no special tools and equipment are required for the standard inspection of the associated components, which exceed the standard tools identified for the system. Level III Inspection Method Guide Sheets will address additional tools and equipment requirements that are specific to that particular method. Inspectors should review these sections in order to determine any special tool requirements for subsystems they are to inspect as part of a Level III inspection.

IX. LEVEL II INSPECTION METHOD KEYS

Certain observations will reference a Level II Inspection Method. The Facility Manager will be able to identify deficiencies where an Level II is flagged. The Level II Key at the observation level will refer to a specific guide sheet. Typically, the inspector should perform the Level II inspections as they occur in the field. However, the Facility Manager may choose to limit the inspection process solely to the Level I inspections.

X. LEVEL III INSPECTION METHOD KEYS

Certain observations will reference a Level III Inspection Method. The Facility Manager will be able to identify deficiencies where a Level III is flagged. The Level III Key at the observation level will refer to a specific guide sheet. These guide sheets, in many cases, will identify the first phase of non-standard testing. These inspections are typically not completed by the inspector. The Facility Manager will schedule Level III inspections for execution based on the guidance provided by the frequency tables and Level I or II defect/observations.

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XI. REPLACEMENT COST

A replacement cost for each component type will be contained within the cost estimating system in the Site CAIS. Site CAIS system manuals contain replacement cost information.

XII. APPENDICES

Appendix A - Abbreviations

A summary and definition of all abbreviations used in this system are contained in Appendix A which is located at the end of Building Conveying Systems.

Appendix B - Glossary

A glossary of terms used in this system are contained in Appendix B which is located at the end of Building Conveying Systems.

Appendix C - Life Cycles

A listing of the average life cycle durations for each assembly* in the Standard.

Note - Facility Manager's Guide

The following are included in the Facility Manager's Guide:

A table showing the required manhours to perform the standard inspection for this facility listed by Cat Code (three digit).

A listing of all Level III inspections with their estimated cost and time to perform. This list will include frequency of inspection for time driven Level III's.

* Assembly is a term describing the level at which replacement rather than repair occurs. This can be at the subsystem or component designation, depending on the system being surveyed.

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Figure 06-A. WORK BREAKDOWN STRUCTURE

SYSTEM	SUB-SYSTEM	COMPONENT
06 BUILDING CONVEYING SYSTEMS	06.01 Hydraulic Elevators	06.01.01 Elevator Cab
		06.01.02 Lift Cylinder
		06.01.03 Hoistway Apparatus
		06.01.04 Hydraulic Tank
		06.01.05 Pumps
		06.01.06 Motors
		06.01.07 Instrumentation
		06.01.08 Equipment Controls and panels
		06.01.09 Pipes and Fittings
		06.01.10 Valves
	06.02 Traction Elevators	06.02.01 Elevator Cab
		06.02.02 Cables and Counterweights
		06.02.03 Drive Assembly
		06.02.04 Hoistway Apparatus
		06.02.05 Motor Generator Set
		06.02.06 Equipment Controls and Panels
	06.03 Escalator	06.03.01 Handrail Assembly
		06.03.02 Motor and Drive Assembly
		06.03.03 Structure
		06.03.04 Controls
	06.04 Pneumatic Tube Assembly	06.04.01 Blower
		06.04.02 Motor
		06.04.03 Tubing and Tube Fittings
		06.04.04 Valves
		06.04.05 Control Center
		06.04.06 Stations
		06.04.07 Transfer Units (Diverters)
		06.04.08 Carriers
	06.05 Moving Walks	06.05.01 Handrail Assembly
		06.05.02 Motor and Drive Assembly
		06.05.03 Structure
		06.05.04 Controls

06 BUILDING CONVEYING SYSTEMS

Figure 06-A. WORK BREAKDOWN STRUCTURE (Continued)

SYSTEM	SUB-SYSTEM	COMPONENT
06 BUILDING CONVEYING SYSTEMS (Continued)	06.06 Conveyor	06.06.01 Belt
		06.06.02 Frame/Support Structure
		06.06.03 Slide
		06.06.04 Guide Rails
		06.06.05 Rollers Carrying/Return/Snub
		06.06.06 Pulleys Drive/Tail/Take-up
		06.06.07 Take-Up Device
		06.06.08 Motor/Gearmotor
		06.06.09 Sheaves and V-belts
		06.06.10 Sprockets and Chain
		06.06.11 Hangers/Braces/Legs
		06.06.12 Controls
	06.07 Bridge Crane	06.07.01 Bridge
		06.07.02 Motors
		06.07.03 Drive Assembly
		06.07.04 Power Supply
		06.07.05 Controls
		06.07.06 Runway/Rails
		06.07.07 Piping Fittings and Hoses
	06.08 Chutes	06.08.01 Chute Tube
		06.08.02 Intake and Discharge Doors
	06.09 Hoists	06.09.01 Motor and Works Housing
		06.09.02 Controls
		06.09.03 Load Blocks and Hooks
		06.09.04 Chain
		06.09.05 Wire Rope
		06.09.06 Hoist Braking System
		06.09.07 Trolley
		06.09.08 Power Supply
		06.09.09 Drive Assembly
		06.09.10 Supporting Structure
		06.09.11 Piping Fittings and Hoses

06 BUILDING CONVEYING SYSTEMS

Figure 06-A. WORK BREAKDOWN STRUCTURE (Continued)

SYSTEM	SUB-SYSTEM	COMPONENT
06 BUILDING CONVEYING SYSTEMS (Continued)	06.10 Dumbwaiters	06.10.01 Car Interior
		06.10.02 Car Doors/Gates
		06.10.03 Hoistway Doors
		06.10.04 Structural Support
		06.10.05 Guide Rails
		06.10.06 Drive Assembly
		06.10.07 Controls
		06.10.08 Motors

06.01 HYDRAULIC ELEVATORS

DESCRIPTION

Hydraulic Elevators provide a means for conveyance between building or structure elevations. They use hydraulic power to raise (push up) and lower a cab. Unlike traction elevators, lift cabling is generally not required. These units are primarily used for service or freight transport because of their level limitations (typically two to six floors), although some small office buildings use them. The system includes the elevator cab, lift cylinder, hoistway apparatus, hydraulic tank, pumps, motors, instrumentation, equipment controls and panels, pipes and fittings, and valves.

SPECIAL TOOL AND EQUIPMENT REQUIREMENTS

None.

SPECIAL SAFETY REQUIREMENTS

Follow applicable safety requirements set forth in the Master Safety Manual and the Elevator Industry Field Employees' Safety Handbook as augmented by local requirements if more stringent.

COMPONENT LIST

- 06.01.01 ELEVATOR CAB
- 06.01.02 LIFT CYLINDER
- 06.01.03 HOISTWAY APPARATUS
- 06.01.04 HYDRAULIC TANK
- 06.01.05 PUMPS
- 06.01.06 MOTORS
- 06.01.07 INSTRUMENTATION
- 06.01.08 EQUIPMENT CONTROLS AND PANELS
- 06.01.09 PIPES AND FITTINGS
- 06.01.10 VALVES

RELATED SUBSYSTEMS

Due to the related nature of the elements requiring examination, the following sections should be reviewed for relevant and concurrent examination activities.

06.02	TRACTION ELEVATORS
09.00	BUILDING FIRE PROTECTION
10.02	BUILDING ELECTRICAL (Low Voltage Dist. System 600 V or less)
10.03	LIGHTING
10.07	POWER SOURCES

06.01 HYDRAULIC ELEVATORS

STANDARD INSPECTION PROCEDURE

Prior to performing a Level I inspection, the inspector(s) should review existing records including as-built drawings, records of periodic inspection and maintenance logs. Since many elevator systems are maintained by service contract, it may be necessary to review contractual documentation to determine the scope of maintenance services provided from that source. Level I inspections for each individual elevator system will include riding the elevator, inspecting the related components at each floor level or landing, and inspecting the machine rooms. Some elevators may have additional remote control panels in building lobbies or at security stations which have to be inspected as well. In some instances, such as ganged installations, more than one elevator system may share components. For example, the dispatching controls that direct elevator movement depending on which calls are received as related to the elevator position of each elevator at the time.

For Level I observations, the inspector will not enter the hoistway or pit for safety reasons. No top-of car inspections will be made. In addition, extreme care has to be taken to remain clear of moving parts associated with these systems because of the random nature of elevator movement. No interlocks will be disabled. All elevators will remain in service. With the exception of using the keyed controls designed for dedicated or fire service elevator operation, no control sequences will be initiated except those available to the general ridership. Inspection requires one person making a visual examination and taking some measurements. The inspection shall be carried out on the basis of individual installations as previously defined. Defects are to be recorded in the Field CAIS.

Level II inspections may require opening of doors and simple overrides of elevator interlocks. The inspector may make visual observations of the pit or hoistway and top and bottom of car without entering the pit or hoistway. Control cabinets may be opened in the machine room. The same safety concerns listed for Level I inspections apply to Level II inspections.

Elevator-related Level III inspections require a trained elevator technician and helper. The inspection procedures and safety guidelines to be used are found in the reference material listed at the end of this section. Additional Level III inspections may be required to evaluate defects in elevator-related components such as those included in the electrical or fire protection systems, for instance.

06.01 HYDRAULIC ELEVATORS

COMPONENTS

◆ 06.01.01 ELEVATOR CAB

Elevator cabs are classified by the service they provide: passenger, service or freight. Passenger elevator cabs generally have interior finishes, fittings, and lighting to compliment the character of the building. Ventilation is also provided. Doors tend to be double-panel, horizontally opening types. Control panels indicate floor levels. Freight elevator cabs are usually made from heavy-duty steel components without interior finish or fittings. Doors to these units are usually manually operated, screened or panel, vertical lift type to maximize opening size. Lighting schemes are simple. Service elevator cabs, intended for double duty as passenger and light freight units, combine features of the previously described types of cabs, but must meet code for passenger cabs. To maintain vertical alignment in the shaft, all cabs have alignment guides (rollers or guide shoes) that slide along rails in the hoistway.

Cab Ride: The first activity in examining an elevator installation is to ride the cab while observing the quality of the ride. Use visual observation, hearing, sense of motion, and even your sense of smell to evaluate the quality of performance. Usually these observations indicate problems with components outside of the cab, including defective cab alignment devices. Other observations relate directly to the cab.

Leveling: The leveling action of the cab should be observed at all landings and approaching from each direction. All leveling motion should occur in the direction of elevator travel. Cab loading and load distribution can impact leveling accuracy. Frequent re-leveling, "hunting", overrun, or stopping the cab out of tolerance from level is considered a defect.

Door Operation: Elevator doors receive the heaviest use during operation. Wear and alignment problems, (See Appearance and Fastenings) and proper door opening and closing sequences must be checked. Doors must not open except at landings. Doors must not close when obstructions remain in the door opening. Doors must respond properly to the activation of on-cab controls.

Lighting: Lighting should be adequate and provided from more than one fixture. Light fixtures should be guarded from breakage and accidental contact. The emergency lighting must be provided from more than one bulb. The battery pack must be mounted on the cab.

Cab Appearance and Fastenings: The cab should be structurally sound. All finishes, including wall, ceiling and floor coverings, doors, and fastenings should be secure and not worn to the point of creating a hazard. Capacity plates and any additional data plates required should be in place. Moving parts, doors, etc., should operate as intended. Sagging floors, bowed panels, or separated joints are some indicators of structural damage or weakness.

Ventilation: Cab ventilation is mandated for passenger elevators. The ventilator is usually cab roof-mounted. For proper operation, the ventilator should run quietly and all associated vents should be clean from dust and should not be obstructed.

06.01 HYDRAULIC ELEVATORS

COMPONENTS (Continued)

◆ 06.01.01 ELEVATOR CAB (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Cab Ride:**			
Observation:			
a. Vertical vibration, jerk or bounce during start-up or stop.	EA		1
***{Severity M}			
b. Horizontal vibration, front-to-back, or side-to-side.	EA		1
***{Severity M}			
c. Noise.	EA		1
***{Severity M}			
d. Electrical/burning odors.	EA		1
***{Severity M}			
e. Oil/hydraulic fluid odors.	EA		1
***{Severity M}			

Defect:

*** Leveling:**			
Observation:			
a. Cab fails to level within $\pm$ 3/8 inch.	EA		2
***{Severity L}			
b. Cab fails to level within $\pm$ 1/2 inch.	EA		2
***{Severity M}			
c. Cab overruns the stops.	EA		2
***{Severity M}			
d. Cab "hunts" (jockeys at a floor).	EA		2
***{Severity H}			

06.01 HYDRAULIC ELEVATORS

COMPONENTS (Continued)

◆ 06.01.01 ELEVATOR CAB (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Door Operation:**			
Observation:			
a. Cab doors fail to re-open for obstruction.	EA		3
***{Severity H}			
b. Cab door fails to respond to Door Open Button.	EA		3
***{Severity H}			
c. Nudging fails to work for door forced open.	EA		3
***{Severity H}			
d. Door-blocked alarm fails to sound.	EA		3
***{Severity H}			
e. Door can open with cab outside landing zone.	EA		3
***{Severity H}			

Defect:

*** Lighting:**			
Observation:			
a. Cab lighting inadequate.	EA		4
***{Severity M}			
b. Cab emergency lighting inadequate.	EA		4
***{Severity M}			

Defect:

*** Ventilation:**			
Observation:			
a. Vent motor noisy.	EA	1	5
***{Severity L}			
b. Vents dirty or blocked.	EA	1	5
***{Severity L}			
c. Vent motor not operating.	EA	1	5
***{Severity M}			

06.01 HYDRAULIC ELEVATORS

COMPONENTS (Continued)

◆ 06.01.01 ELEVATOR CAB (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Cab Appearance and Fastenings:**			
Observation:			
a. Panels not secure. ***{Severity M}	EA		5
b. Handrails or other fixtures not secure. ***{Severity M}	EA		5
c. Required signage missing. ***{Severity M}	EA		5
d. Required capacity plate missing. ***{Severity M}	EA		5
e. Cab wall finishes damaged. ***{Severity M }	SF		
f. Cab ceiling finishes damaged. ***{Severity M }	SF		
g. Cab floor finishes damaged. ***{Severity M}	SF		
h. Door hangars loose, bent or damaged. ***{Severity M}	EA		5
i. Sills worn. ***{Severity M}	LF		5
j. Door operation restricted. ***{Severity H}	EA		5
k. Evidence of structural damage or weakness. ***{Severity H}	EA		5

06.01 HYDRAULIC ELEVATORS

COMPONENTS (Continued)

◆ 06.01.02 LIFT CYLINDER

The lift cylinder assembly is a single or dual cylinder and piston arrangement attached to the cab. Oil from the hydraulic system is pumped under high pressure to displace the piston to raise the cab. This oil is released into a holding tank to lower the cab. Hydraulic controllers are used to position the cab at each level of access along the hoistway.

Most often, the cylinders are mounted in sand and concrete in the floor of the hoistway pit. These cylinders are topped with buffers to protect the cab during descent.

For some installations, telescoping pistons are used. These pistons require an additional seal at each section of the telescope.

Lift cylinder corrosion can be observed through the hoistway doors and from machine rooms adjacent to the pit. Unless observation is possible without entering these spaces, it shall be deferred to Level III inspection. Look for piston corrosion near the cab connection.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Lift Cylinder Inoperable:**			
Observation:			
a. Control failure.	EA		6
***{Severity H}			
b. Pipe or cylinder leakage as evidenced by low oil level in tank.	EA		6
***{Severity H}			
c. Defective control wiring.	EA		6
***{Severity H}			
d. Defective power/pump wiring.	EA		6
***{Severity H}			

Defect:

*** Lift Cylinder or Piston Corrosion:**			
Observation:			
a. Surface corrosion (no pitting evident).	SF		6
***{Severity L}			
b. Corrosion evidenced by pitting or blistering.	SF		6
***{Severity M}			
c. Corrosion evidenced by holes or loss of base metal.	EA		6
***{Severity H }			

06.01 HYDRAULIC ELEVATORS

COMPONENTS (Continued)

◆ 06.01.02 LIFT CYLINDER (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Leakage (evidence of worn or damaged seals):**			
Observation:			
a. Light seeping.	EA		6
***{Severity M}			
b. Leaks, hydraulic fluid in pit.	EA		6
***{Severity H}			

Defect:

	UOM	LEVEL II KEY	LEVEL III KEY
*** Damaged Cylinder or Piston:**			
Observation:			
a. Cracks.	EA		6
***{Severity H}			
b. Distortion.	EA		6
***{Severity H}			

Defect:

	UOM	LEVEL II KEY	LEVEL III KEY
*** Fasteners (retaining ring or cab connection) loose or missing:**			
Observation:			
a. Fasteners worn.	EA		6
***{Severity M}			
b. Fasteners missing.	EA		6
***{Severity H}			

06.01 HYDRAULIC ELEVATORS

COMPONENTS (Continued)

◆ 06.01.03 HOISTWAY APPARATUS

There are three major assemblies in the hoistway: guide rails, hoistway doors, and buffers. The hoistway also contains some control switches and sensors which are listed under 06.01.08, Equipment Controls and Panels.

These features require observation from the hoistway (usually accomplished by riding the top of the cab) and from the pit. Because of the inherent danger, these observations should be accomplished only by trained elevator mechanics. For the purpose of this evaluation, secondary indicators must be used. A bumpy ride, vibrations, noise and even smells, all indicate that some equipment in the hoistway may be worn or misaligned. Use the latest elevator inspection record and record of maintenance since the last inspection to serve as an indicator of the condition of items that cannot be evaluated directly.

Guide Rails: Guide rails are installed on both sides of the cab to control vertical alignment. They are normally bracket-mounted to the hoistway surface. Examination will include wear, alignment and fastening.

Hoistway Doors: Each level of access is protected by a hoistway door. For passenger elevators, they are motorized for ease of operation, and are similar to horizontal-motion cab doors. For freight elevators, the hoistway door is typically of double panel, vertical motion design. The lower half drops below floor level, the upper half raises for maximum access.

Buffers: Buffers are installed in the elevator pit to cushion cab stopping if it over-travels the lower limits. These units are either springs or oil-filled dampers.

Defect:	**UOM**	**LEVEL II KEY**	**LEVEL III KEY**
*** Guide Rails:**			
Observation:			
a. Guide rails worn.	LF		7
***{Severity H}			
b. Loose or missing fasteners.	EA		7
***{Severity H}			
c. Guide rails out of alignment.	LF		7
***{Severity H}			

06.01 HYDRAULIC ELEVATORS

COMPONENTS (Continued)

◆ 06.01.03 HOISTWAY APPARATUS (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Hoistway Doors:**			
Observation:			
a. Loose or missing fasteners. ***{Severity M}	EA		7
b. Hoistway doors damaged. ***{Severity M}	EA		7
c. Hoistway doors inoperable. ***{Severity H}	EA		7

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Buffers:**			
Observation:			
a. Oil level low or leakage. ***{Severity M }	EA		8
b. Cab hits buffer during normal operation. ***{Severity H}	EA		8
c. Buffer damaged or misaligned. ***{Severity H}	EA		8
d. Buffer spring broken or distorted. ***{Severity H}	EA		8

06.01 HYDRAULIC ELEVATORS

COMPONENTS (Continued)

◆ 06.01.04 HYDRAULIC TANK

Tanks are used to collect and store the hydraulic fluid. They should have sufficient capacity to provide for adequate fluid reserve and must be adequately covered to prevent foreign materials from entering the system. Tanks should be vented to the atmosphere.

Tanks should be located and supported so that the entire exterior is accessible for periodic maintenance and repair. They must provide a means of checking the fluid level without removing the cover or any other part.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Tank Corroded:**			
Observation:			
a. Surface corrosion (no pitting evident). ***{Severity L}	SF		
b. Corrosion evidenced by pitting or blistering. ***{Severity M}	SF		
c. Corrosion evidenced by holes or loss of base metal. ***{Severity H}	EA		9

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Tank Leaks:**			
Observation:			
a. Physical damage. ***{Severity H}	EA		9
b. Inadequate support. ***{Severity H}	EA		9
c. Seam/joint failure. ***{Severity H}	LF		9
d. Fitting failure. ***{Severity H}	EA		9

06.01 HYDRAULIC ELEVATORS

COMPONENTS (Continued)

◆ 06.01.05 PUMPS

Pumps are used to develop the fluid pressure to raise the elevator cab and its load. Positive displacement pumps are typically used. Each pump or group of pumps must be equipped with a pump relief valve.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Pump Inoperable:**			
Observation:			
a. Rotor locked.	EA		10
***{Severity H}			
b. Missing.	EA		10
***{Severity H}			
Defect:			
*** Excessive Noise/Vibration:**			
Observation:			
a. Grinding (metal on metal) sounds.	EA		10
***{Severity H}			
b. Excessive vibration.	EA		10
***{Severity H}			
Defect:			
*** Corrosion:**			
Observation:			
a. Surface corrosion (no pitting evident).	SF		10
***{Severity L}			
b. Corrosion evidenced by pitting or blistering.	SF		10
***{Severity M}			
c. Corrosion evidenced by holes or loss of base metal.	EA		10
***{Severity H}			
Defect:			
*** Seal Leaks:**			
Observation:			
a. Evidence of oil seeping.	EA		10
***{Severity L}			
b. Oil leaks.	EA		10
***{Severity M}			

06.01 HYDRAULIC ELEVATORS

COMPONENTS (Continued)

◆ 06.01.06 MOTORS

Most motors for hydraulic pumps are open AC induction units operating in a narrow speed range.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Corrosion:**			
Observation:			
a. Surface corrosion (no pitting evident). ***{Severity L}	SF		
b. Corrosion evidenced by pitting or blistering. ***{Severity M}	SF		
c. Corrosion evidenced by holes or loss of base metal. ***{Severity H}	EA		11

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Housekeeping:**			
Observation:			
a. Motor housings contaminated. ***{Severity L}	EA		11
b. Machine air passage dirty or clogged. ***{Severity M}	EA		

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Structure:**			
Observation:			
a. Motor frame cracked or broken. ***{Severity M}	EA		11
b. Motor support cracked or broken. ***{Severity M}	EA		11
c. Motor support shifted. ***{Severity M}	EA		11
d. Defective mounting pads. ***{Severity M}	EA		11
e. Loose or missing mounting bolts. ***{Severity H}	EA		11

06.01 HYDRAULIC ELEVATORS

COMPONENTS (Continued)

◆ 06.01.06 MOTORS (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Motor Operation:**			
Observation:			
a. Excessively noisy. ***{Severity L}	EA		12
b. Excessive vibration. ***{Severity M}	EA		12
c. Excessive sparking at the collector rings, commutator, or brushes. ***{Severity M}	EA		13

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Power Connections:**			
Observation:			
a. Terminal box cover missing. ***{Severity L}	EA		
b. Insulation of motor leads damaged or deteriorated. ***{Severity M}	EA	2	
c. Taping improperly installed or deteriorated. ***{Severity M}	EA	2	
d. Unit not grounded. ***{Severity H}	EA	2	

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Hot Spots:**			
Observation :			
a. Terminal 5° to 24°C above ambient. ***{Severity M}	EA	3	14
b. Terminal 25° or more above ambient. ***{Severity H}	EA	3	14

06.01 HYDRAULIC ELEVATORS

COMPONENTS (Continued)

◆ 06.01.07 INSTRUMENTATION

A main line pressure gauge must indicate correct pressure to not less than 1.5 times the pressure setting on the relief valve. Pressure gauges are typically provided at the suction and discharge of each pump and on the tank. They should be installed by pipe and fittings in such a manner that they cannot be isolated from the hydraulic system except by the stop cock. The stop cock shall have a "T" or lever handle set in line with the direction of flow through the valve when open.

Tanks usually have one or more gauge glasses attached directly to the tank and are equipped with automatic shutoff in case of glass failure.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Instrumentation Inoperable:**			
Observation:			
a. Shows no reading.	EA		15
***{Severity M}			
b. Shows signs of corrosion.	EA		15
***{Severity M}			
c. Missing.	EA		15
***{Severity H}			

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Instrumentation Inaccurate:**			
Observation:			
a. Partial response to operating change.	EA		15
***{Severity M}			
b. Readings fluctuate for no apparent reason.	EA		15
***{Severity M}			
c. Documentation indicates calibration overdue.	EA		15
***{Severity M}			
d. Illegible from damage or corrosion.	EA		15
***{Severity M}			

06.01 HYDRAULIC ELEVATORS

COMPONENTS (Continued)

◆ 06.01.08 EQUIPMENT CONTROLS AND PANELS

Control panels are provided in the cab, at all service levels, and on the main unit. The cab panel includes switches for floor selection, lighting control, manual override and cab alarms. Modern units include an emergency phone, intercom and may have a TV camera for security. Selector switches and indicators at each service level indicate service requests and cab status. Hoistway doors employ safety devices such as photocells and/or safety strips to detect door blockage. The hoistway and cab contain equipment positioning and safety controls: floor stop, limit, and cab gate switches. These are interlocked to prevent operation with open doors and to prevent door opening unless the cab is properly positioned. The main control panel includes a motor controller, limit relays, and overload devices. Where multiple cabs are included, scheduling (dispatching) controls are also included. Most units employ a typical motor starter and disconnect for AC motors. Hydraulic tanks are typically equipped with a liquid level controller that will render the elevator inoperable if the level in the tank falls below the minimum permissible level.

Defect:	**UOM**	**LEVEL II KEY**	**LEVEL III KEY**
*** In-Cab Controls and Signals:**			
Observation:			
a. Call buttons fail to illuminate. ***{Severity L}	EA		16
b. Handicapped markings not in place. ***{Severity M}	EA		
c. Cab position indicator not operating. ***{Severity M}	EA		16
d. Alarm bell not audible in lobby/watch station. ***{Severity M}	EA		16
e. Stop switch fails to engage alarm. ***{Severity L}	EA		16
f. Intercom inoperable. ***{Severity M}	EA		16
g. Firefighters (Emergency) switch inoperable. ***{Severity M}	EA		16
h. Independent service controls inoperable. ***{Severity M}	EA		16
i. Alarm bell not working. ***{Severity H}	EA		16
j. Alarm bell not audible in cab. ***{Severity H}	EA		16
k. Telephone inoperable. ***{Severity H}	EA		16
l. Closed circuit TV inoperable. ***{Severity H}	EA		16

06.01 HYDRAULIC ELEVATORS

COMPONENTS (Continued)

◆ 06.01.08 EQUIPMENT CONTROLS AND PANELS (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Service-Level Controls:**			
Observation:			
a. Call button indicators will not light. ***{Severity L}	EA		17
b. Floor indicators (lanterns) fail to light. ***{Severity L}	EA		17
c. Gong fails to sound. ***{Severity L}	EA		17
d. Call buttons inoperable. ***{Severity M}	EA		17
e. Door interlocks inoperable. ***{Severity H}	EA		17

Defect:

*** Main Control:**			
Observation:			
a. Units dirty. ***{Severity M}	EA		18
b. Housing corroded. ***{Severity M}	EA		18
c. Wiring frayed or burned. ***{Severity M}	EA		18
d. Relays pitted or burned. ***{Severity H}	EA		18
e. Indications of overheating. ***{Severity H}	EA		18

06.01 HYDRAULIC ELEVATORS

COMPONENTS (Continued)

◆ 06.01.09 PIPES AND FITTINGS

Piping and fittings provide hydraulic fluid distribution. The distribution network is typically a single pipe system installed above ground. Below ground systems should include corrosion protection. Pipe connections could be welded, grooved, threaded or bolted flange type.

Flexible connections are typically provided for pump suction and discharge. Flexible hose and fitting assemblies should not be installed in the hoistway nor project through any walls.

Strainers are typically provided at the suction side of the pump to protect the pump, cylinder surfaces and metering devices.

Fittings should be compatible with the type of material used in the system to minimize corrosion induced by galvanic action. Dielectric unions should be provided to isolate pipe materials if required to prevent corrosion.

Flanges or escutcheons should be fitted over pipe penetrations through walls in public areas. All pipe penetrations through fire walls should be provided with an appropriate fire-stop.

Defect:	**UOM**	**LEVEL II KEY**	**LEVEL III KEY**
*** Pipe Leakage:**			
Observation:			
a. Pipe inadequately supported.	LF		19
***{Severity M}			
b. Pipe corroded.	LF		19
***{Severity H}			
c. Pipe damaged.	LF		19
***{Severity H}			

Defect:	**UOM**	**LEVEL II KEY**	**LEVEL III KEY**
*** Pipe Fittings Defective:**			
Observation:			
a. Fittings corroded.	EA		19
***{Severity H}			
b. Fittings damaged.	EA		19
***{Severity H}			

06.01 HYDRAULIC ELEVATORS

COMPONENTS (Continued)

◆ 06.01.10 VALVES

Regulating valves are also used to control the flow of hydraulic fluid to and from the main cylinder and thereby control cab speed and positioning. These are typically operated by the control system. However, a manually operated valve, located on or near the control valves should be installed to permit lowering in emergencies.

Manual valves are also provided to permit isolation and drainage of components for maintenance. Each pump or group of pumps must have a pump relief valve installed between the pump and the check valve. The pump relief valve must be installed in such a manner that it cannot be isolated from the hydraulic system. The valve must be set to relieve at a pressure less than 125 percent of working pressure and must be of sufficient size to pass the maximum rated capacity of the pump without raising the system pressure more than 20 percent above the valve relief pressure.

A check valve must be installed that will hold the elevator cab and its load at any point when the pump stops or the system pressure drops below minimum operating pressure. A vacuum relief valve is typically installed on the pressure tank to prevent collapse.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Valve Leakage:**			
Observation:			
a. Valve seeps at stem or fittings. ***{Severity M}	EA		20
b. Valve leaks at stem or fittings. ***{Severity H}	EA		20
c. Muffler leakage. ***{Severity H}	EA		20

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Valve Inoperable:**			
Observation:			
a. Valve stem motion restricted by corrosion. ***{Severity M}	EA		20
b. Damaged operating mechanism. ***{Severity H}	EA		20

06.01 HYDRAULIC ELEVATORS

REFERENCES

1. Applicable jurisdictional regulations as required
2. ANSI/CABO A117.1-1992 Building and Facilities - Providing Accessibility and Usability for Physically Handicapped People
3. ANSI/ASME A17.1 Safety Code for Elevators and Escalators, latest edition
4. ANSI/ASME A17.2 Inspectors' Manual for Elevators and Escalators, latest edition
5. Elevator Industry Field Employees' Safety Handbook, latest edition (Available from Elevator World, PO Box 6507, Mobile AL 36606)
6. Master Safety Manual, Fluor Daniel

06.01 HYDRAULIC ELEVATORS

LEVEL II KEY	GUIDE SHEET CONTROL NUMBER
1	GS-II 06.01.01-1
2	GS-II 06.01.06-2
3	GS-II 06.01.06-3

LEVEL III KEY	GUIDE SHEET CONTROL NUMBER
1	GS-III 06.01.01-1
2	GS-III 06.01.01-2
3	GS-III 06.01.01-3
4	GS-III 06.01.01-4
5	GS-III 06.01.01-5
6	GS-III 06.01.02-6
7	GS-III 06.01.03-7
8	GS-III 06.01.03-8
9	GS-III 06.01.04-9
10	GS-III 06.01.05-10
11	GS-III 06.01.06-11
12	GS-III 06.01.06-12
13	GS-III 06.01.06-13
14	GS-III 06.01.06-14
15	GS-III 06.01.07-15
16	GS-III 06.01.08-16
17	GS-III 06.01.08-17
18	GS-III 06.01.08-18
19	GS-III 06.01.09-19
20	GS-III 06.01.10-20

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 1

COMPONENT: ELEVATOR CAB
CONTROL NUMBER: GS-II 06.01.01-1

Application

This guide applies to the investigation of the inside of an enclosure, containing bare, energized, electrical parts.

Special Safety Requirements

The following list of special safety requirements, beyond the requirements listed in the Master Safety Plan and System Safety Section, are to be observed in the performance of this inspection.

1. This inspection guide applies to enclosures containing live electrical parts having a potential of 600 volts or less above ground. If the enclosure contains circuitry of higher potential, do not use this inspection guide.

2. Any enclosure that is padlocked for safety reason is not to be opened unless okayed by the person having control of the key.

3. Inspector needs to carefully open, inspect the inside and close the enclosure without shutting down the equipment, and without creating a hazard to himself.

Inspection Actions

1. Open panels or doors carefully as required for doing the visual inspection.

2. Visually inspect for those physical damaged defects that are listed and tagged Level II Key No. as indicated above.

3. Close panels or doors carefully after the inspection is completed.

Recommended Inspection Frequency

Do a Level II inspection each time a Level I inspection indicates one is required.

References

1. Sverdrup Corporation

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 2

COMPONENT: MOTORS
CONTROL NUMBER: GS-II 06.01.06-2

Application

This guide applies to the investigation of the inside of an enclosure, containing bare, energized, electrical parts.

Special Safety Requirements

The following list of special safety requirements, beyond the requirements listed in the Master Safety Plan and System Safety Section, are to be observed in the performance of this inspection.

1. This inspection guide applies to enclosures containing live electrical parts having a potential of 600 volts or less above ground. If the enclosure contains circuitry of higher potential, do not use this inspection guide.

2. Any enclosure that is padlocked for safety reason is not to be opened unless okayed by the person having control of the key.

3. Inspector needs to carefully open, inspect the inside and close the enclosure without shutting down the equipment, and without creating a hazard to himself.

Inspection Actions

1. Open panels or doors carefully as required for doing the visual inspection.

2. Visually inspect for those physical damaged defects that are listed and tagged Level II Key No. as indicated above.

3. Close panels or doors carefully after the inspection is completed.

Recommended Inspection Frequency

Do a Level II inspection each time a Level I inspection indicates one is required.

References

1. Sverdrup Corporation

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 3

COMPONENT: MOTORS
CONTROL NUMBER: GS-II 06.01.06-3

Application

This guide applies to the investigation of the inside of an enclosure, containing bare, energized, electrical parts.

Special Safety Requirements

The following list of special safety requirements, beyond the requirements listed in the Master Safety Plan and System Safety Section, are to be observed in the performance of this inspection.

1. This inspection guide applies to enclosures containing live electrical parts having a potential of 600 volts or less above ground. If the enclosure contains circuitry of higher potential, do not use this inspection guide.

2. Any enclosure that is padlocked for safety reason is not to be opened unless okayed by the person having control of the key.

3. Inspector needs to carefully open, inspect the inside and close the enclosure without shutting down the equipment, and without creating a hazard to himself.

Inspection Actions

1. Open panels or doors carefully and to the degree required for scanning those devices being tested.

2. Make temperature measurements with an infrared scanner.

3. Measure the ambient temperature by measuring a spot on the inside of the enclosure that is least effected by any internal panel heat source.

4. Measure the temperature of the device specified.

5. Above ambient temperature is calculated by subtracting the ambient temperature from the device temperature.

6. Record the results.

7. Close panels or doors carefully after the inspection is complete.

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 3 (Continued)

COMPONENT: MOTORS
CONTROL NUMBER: GS-II 06.01.06-3

Recommended Inspection Frequency

Do a Level II inspection each time a Level I inspection is made.

References

1. Maintenance Technology/September 1993; Write-up Title: "Infrared Keeps All Systems Go"

2. Raining - Agema Infrared Systems; "Measurement of Excess Temperatures with Infrared Scanners"

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 1

COMPONENT: ELEVATOR CAB
CONTROL NUMBER: GS-III 06.01.01-1

Application

This guide applies to the investigation of cab ride as described in ASME 17.2 and Elevator World's Guide to Elevatoring Section 7, pp 221-225.

Special Safety Requirements

Special safety requirements needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section are listed in Division 4 of the introduction of ASME 17.2 and the specific section of that publication referred to in the text of this guide sheet. Proper conduct of this inspection requires a trained elevator mechanic as outlined in QEI-1 Standard for the Qualification of Elevator Inspectors, as augmented by local code or regulation.

Inspection Actions

1. Verify the extent of inspections required in the reference sections listed above.
2. Inspect components and subcomponents according to the reference provided.
3. Report all deficiencies to the facility manager.

Special Tools and Equipment

Special tools required beyond those listed in the Standard Tool Section are at the discretion of the inspector. A guide list is found in Division 7 of the introduction to ASME 17.2.

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level I inspection.

References

1. ASME 17.2
2. QEI-1, Standard for the Qualification of Elevator Inspectors
3. Elevator World's Guide to Elevatoring Section 7

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 2

COMPONENT: ELEVATOR CAB
CONTROL NUMBER: GS-III 06.01.01-2

Application

This guide applies to the investigation of cab leveling accuracy as described in ASME 17,2 Divisions 100 and 203.

Special Safety Requirements

Special safety requirements needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section are listed in Division 4 of the introduction of ASME 17.2 and the specific section of that publication referred to in the text of this guide sheet. Proper conduct of this inspection requires a trained elevator mechanic as outlined in QEI-1 Standard for the Qualification of Elevator Inspectors, as augmented by local code or regulation.

Inspection Actions

1. Verify the extent of inspections required in the reference sections listed above.

2. Inspect components and subcomponents according to the reference provided.

3. Report all deficiencies to the facility manager.

Special Tools and Equipment

Special tools required beyond those listed in the Standard Tool Section are at the discretion of the inspector. A guide list is found in Division 7 of the introduction to ASME 17.2.

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level I inspection.

References

1. ASME 17.2

2. QEI-1, Standard for the Qualification of Elevator Inspectors

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 3

COMPONENT: ELEVATOR CAB
CONTROL NUMBER: GS-III 06.01.01-3

Application

This guide applies to the investigation of cab door operation as described in ASME 17.2 Divisions 100 and 101.

Special Safety Requirements

Special safety requirements needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section are listed in Division 4 of the introduction of ASME 17.2 and the specific section of that publication referred to in the text of this guide sheet. Proper conduct of this inspection requires a trained elevator mechanic as outlined in QEI-1 Standard for the Qualification of Elevator Inspectors, as augmented by local code or regulation.

Inspection Actions

1. Verify the extent of inspections required in the reference sections listed above.

2. Inspect components and subcomponents according to the reference provided.

3. Report all deficiencies to the facility manager.

Special Tools and Equipment

Special tools required beyond those listed in the Standard Tool Section are at the discretion of the inspector. A guide list is found in Division 7 of the introduction to ASME 17.2.

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level I inspection.

References

1. ASME 17.2

2. QEI-1, Standard for the Qualification of Elevator Inspectors

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 4

COMPONENT: ELECTRICAL CAB

CONTROL NUMBER: GS-III 06.01.01-4

Application

This guide applies to the investigation of elevator cab lighting as described in ASME 17.2 Division 101, Item 101.1.

Special Safety Requirements

Special safety requirements needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section are listed in Division 4 of the introduction of ASME 17.2 and the specific section of that publication referred to in the text of this guide sheet. Proper conduct of this inspection requires a trained elevator mechanic as outlined in QEI-1 Standard for the Qualification of Elevator Inspectors, as augmented by local code or regulation.

Inspection Actions

1. Verify the extent of inspections required in the reference sections listed above.
2. Inspect components and subcomponents according to the reference provided.
3. Report all deficiencies to the facility manager.

Special Tools and Equipment

Special tools required beyond those listed in the Standard Tool Section are at the discretion of the inspector. A guide list is found in Division 7 of the introduction to ASME 17.2.

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level I inspection.

References

1. ASME 17.2
2. QEI-1, Standard for the Qualification of Elevator Inspectors

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 5

COMPONENT: ELEVATOR CAB
CONTROL NUMBER: GS-III 06.01.01-5

Application

This guide applies to the investigation of cab appearance, fastenings and ventilation as described in ASME 17.2, Division 101.

Special Safety Requirements

Special safety requirements needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section are listed in Division 4 of the introduction of ASME 17.2 and the specific section of that publication referred to in the text of this guide sheet. Proper conduct of this inspection requires a trained elevator mechanic as outlined in QEI-1 Standard for the Qualification of Elevator Inspectors, as augmented by local code or regulation.

Inspection Actions

1. Verify the extent of inspections required in the reference sections listed above.
2. Inspect components and subcomponents according to the reference provided.
3. Report all deficiencies to the facility manager.

Special Tools and Equipment

Special tools required beyond those listed in the Standard Tool Section are at the discretion of the inspector. A guide list is found in Division 7 of the introduction to ASME 17.2.

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level I or Level II inspection.

References

1. ASME 17.2
2. QEI-1, Standard for the Qualification of Elevator Inspectors

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 6

COMPONENT: LIFT CYLINDER
CONTROL NUMBER: GS-III 06.01.02-6

Application

This guide applies to the investigation of lift cylinder, piston and plunger subcomponents as described in parts of ANSI 17.2 Divisions 204 and 205.

Special Safety Requirements

Special safety requirements needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section are listed in Division 4 of the introduction of ASME 17.2 and the specific section of that publication referred to in the text of this guide sheet. Proper conduct of this inspection requires a trained elevator mechanic as outlined in QEI-1 Standard for the Qualification of Elevator Inspectors, as augmented by local code or regulation.

Inspection Actions

1. Verify the extent of inspections required in the reference sections listed above.

2. Inspect components and subcomponents according to the reference provided.

3. Report all deficiencies to the facility manager.

Special Tools and Equipment

Special tools required beyond those listed in the Standard Tool Section are at the discretion of the inspector. A guide list is found in Division 7 of the introduction to ASME 17.2.

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level I inspection.

References

1. ASME 17.2

2. QEI-1, Standard for the Qualification of Elevator Inspectors

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 7

COMPONENT: HOISTWAY APPARATUS
CONTROL NUMBER: GS-III 06.01.03-7

Application

This guide applies to the investigation of hoistway guide rails and hoistway doors as described in parts of ASME 17.2, Division 103.

Special Safety Requirements

Special safety requirements needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section are listed in Division 4 of the introduction of ASME 17.2 and the specific section of that publication referred to in the text of this guide sheet. Proper conduct of this inspection requires a trained elevator mechanic as outlined in QEI-1 Standard for the Qualification of Elevator Inspectors, as augmented by local code or regulation.

Inspection Actions

1. Verify the extent of inspections required in the reference sections listed above.

2. Inspect components and subcomponents according to the reference provided.

3. Report all deficiencies to the facility manager.

Special Tools and Equipment

Special tools required beyond those listed in the Standard Tool Section are at the discretion of the inspector. A guide list is found in Division 7 of the introduction to ASME 17.2.

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level I inspection.

References

1. ASME 17.2

2. QEI-1, Standard for the Qualification of Elevator Inspectors

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 8

COMPONENT: HOISTWAY APPARATUS
CONTROL NUMBER: GS-III 06.01.03-8

Application

This guide applies to the investigation of buffers as described in parts of ASME 17.2, Divisions 105.

Special Safety Requirements

Special safety requirements needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section are listed in Division 4 of the introduction of ASME 17.2 and the specific section of that publication referred to in the text of this guide sheet. Proper conduct of this inspection requires a trained elevator mechanic as outlined in QEI-1 Standard for the Qualification of Elevator Inspectors, as augmented by local code or regulation.

Inspection Actions

1. Verify the extent of inspections required in the reference sections listed above.
2. Inspect components and subcomponents according to the reference provided.
3. Report all deficiencies to the facility manager.

Special Tools and Equipment

Special tools required beyond those listed in the Standard Tool Section are at the discretion of the inspector. A guide list is found in Division 7 of the introduction to ASME 17.2.

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level I inspection.

References

1. ASME 17.2
2. QEI-1, Standard for the Qualification of Elevator Inspectors

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 9

COMPONENT: HYDRAULIC TANK
CONTROL NUMBER: GS-III 06.01.04-9

Application

This guide applies to the investigation of hydraulic tanks as described in parts of ASME 17.2, Division 104 and 204.

Special Safety Requirements

Special safety requirements needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section are listed in Division 4 of the introduction of ASME 17.2 and the specific section of that publication referred to in the text of this guide sheet. Proper conduct of this inspection requires a trained elevator mechanic as outlined in QEI-1 Standard for the Qualification of Elevator Inspectors, as augmented by local code or regulation.

Inspection Actions

1. Verify the extent of inspections required in the reference sections listed above.

2. Inspect components and subcomponents according to the reference provided.

3. Report all deficiencies to the facility manager.

Special Tools and Equipment

Special tools required beyond those listed in the Standard Tool Section are at the discretion of the inspector. A guide list is found in Division 7 of the introduction to ASME 17.2.

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level I inspection.

References

1. ASME 17.2

2. QEI-1, Standard for the Qualification of Elevator Inspectors

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 10

COMPONENT: PUMPS
CONTROL NUMBER: GS-III 06.01.05-10

Application

This guide applies to the investigation of pumps as described in parts of ASME 17.2, Division 204.

Special Safety Requirements

Special safety requirements needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section are listed in Division 4 of the introduction of ASME 17.2 and the specific section of that publication referred to in the text of this guide sheet. Proper conduct of this inspection requires a trained elevator mechanic as outlined in QEI-1 Standard for the Qualification of Elevator Inspectors, as augmented by local code or regulation.

Inspection Actions

1. Verify the extent of inspections required in the reference sections listed above.

2. Inspect components and subcomponents according to the reference provided.

3. Report all deficiencies to the facility manager.

Special Tools and Equipment

Special tools required beyond those listed in the Standard Tool Section are at the discretion of the inspector. A guide list is found in Division 7 of the introduction to ASME 17.2.

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level I inspection.

References

1. ASME 17.2

2. QEI-1, Standard for the Qualification of Elevator Inspectors

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 11

COMPONENT: MOTORS
CONTROL NUMBER: GS-III 06.01.06-11

Application

This guide applies to the investigation of motors as described in ASME 17.2, Division 204.

Special Safety Requirements

Special safety requirements needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section are listed in Division 4 of the introduction of ASME 17.2 and the specific section of that publication referred to in the text of this guide sheet. Proper conduct of this inspection requires a trained elevator mechanic as outlined in QEI-1 Standard for the Qualification of Elevator Inspectors, as augmented by local code or regulation.

Inspection Actions

1. Verify the extent of inspections required in the reference sections listed above.

2. Inspect components and subcomponents according to the reference provided.

3. Report all deficiencies to the facility manager.

Special Tools and Equipment

Special tools required beyond those listed in the Standard Tool Section are at the discretion of the inspector. A guide list is found in Division 7 of the introduction to ASME 17.2.

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level I inspection.

References

1. ASME 17.2

2. QEI-1, Standard for the Qualification of Elevator Inspectors

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 12

COMPONENT: MOTORS
CONTROL NUMBER: GS-III 06.01.06-12

Application

This guide applies to the investigation of electrical motors having excessive noise or vibration symptoms.

Special Safety Requirements

No special safety requirements are needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section.

Inspection Actions

1. Verify the findings of Level I inspection by using the vibration/sound level meter and measure the velocity (inches/second, peak), displacement (mils, peak-peak) and noise (db). Compare reading with acceptable manufacturer tolerances.

2. Inspect bearings for defects or dryness.

3. Inspect electrical motor and load unit for misalignment.

4. Inspect electrical motor and load unit for proper mounting.

5. Inspect electrical motor and load unit for transfer of vibration from another source.

6. Inspect coupling for loose connection.

7. If none of the above is the problem, reference manufacturer troubleshooting guide for additional inspections or repairs to be made.

Special Tools and Equipment

The following is a list of special tools required beyond those listed in the Standard Tool Section.

1. Vibration/sound level meter, IDR Mechanalysis #1TC87

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 12 (Continued)

COMPONENT: MOTORS
CONTROL NUMBER: GS-III 06.01.06-12

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level I inspection.

References

1. KATO Engineering, Instruction Manual for Brushless Revolving Field Alternating Current Generators

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 13

COMPONENT: MOTORS
CONTROL NUMBER: GS-III 06.01.06-13

Application

This guide applies to the investigation of excessive sparking at the collector rings, commutator or brushes.

Special Safety Requirements

No special safety requirements are needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section.

Inspection Actions

Level I Inspector will detect excessive sparking in the area of either the collector rings, commutator or brushes. Level III Inspector will perform the following tasks.

1. Verify that there is excessive sparking in the area of either the collector rings, commutator or brushes.

2. If there is a problem, stop the motor and evaluate the problems causing the sparking.

3. Classify the severity of the problem and recommend the procedure needed to correct the problem.

4. If the Level III Inspector can not evaluate the problem, recommend the next procedure required to further identify the correction procedure that needs to be followed.

Special Tools and Equipment

The following is a list of special tools required beyond those listed in the Standard Tool Section.

1. Wrenches

2. Feelers

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 13 (Continued)

COMPONENT: MOTORS
CONTROL NUMBER: GS-III 06.01.06-13

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level I inspection.

References

1. "Handbook of Building and Plant Maintenance, Forms and Checklists" by Roger W. Liska and Judith Morrison Liska

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 14

COMPONENT: MOTORS
CONTROL NUMBER: GS-III 06.01.06-14

Application

This guide applies to the investigation of a hot terminal or device that is overheating from the flow of current through that terminal or device.

Special Safety Requirements

No special safety requirements are needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section.

Inspection Actions

1. Verify the findings of Level II inspection by using the Infrared Scanner and measuring the temperatures of the device and terminals. If the device or terminals are not hot as indicated by the findings of Level II inspection, check the current flow through the device or terminals. Heat generated is proportionate to the square of the current. If there is little or no current flow through the device or terminal at the time of measurement, there will be no significant amount of heat generated.

2. For terminal connections, verify the type of conductor being terminated. If the conductor is an aluminum conductor, look for evidence of cold flow or melt down of conductor.

3. If there is evidence of cold flow or melt down of the aluminum conductor, the conductor should either be replaced or shortened and reconnected. When making new aluminum conductor terminations a joint compound should be used.

4. If the terminal is loose it should be tightened. De-energize prior to attempting tightening of terminal connections.

5. If none of the above is the problem than there is an internal problem and an on-site analysis must be made to determine if additional inspections are to be made or the unit is to be replaced.

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 14 (Continued)

COMPONENT: MOTORS
CONTROL NUMBER: GS-III 06.01.06-14

Special Tools and Equipment

The following is a list of special tools required beyond those listed in the Standard Tool Section.

1. Infrared Scanner, Raytek, Inc., #PM2EM-L2

2. Torque wrench

3. Digital Multimeter, Fluke #1TC676

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level II inspection.

References

1. Maintenance Technology/September 1993; Write-up Title: Infrared Keeps All Systems Go

2. Raining - Agema Infrared Systems; Measurement of Excess Temperatures with Infrared Scanners

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 15

COMPONENT: INSTRUMENTATION
CONTROL NUMBER: GS-III 06.01.07-15

Application

This guide applies to the investigation of elevator instrumentation as described in parts of ASME 17.2, Division 204.

Special Safety Requirements

Special safety requirements needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section are listed in Division 4 of the introduction of ASME 17.2 and the specific section of that publication referred to in the text of this guide sheet. Proper conduct of this inspection requires a trained elevator mechanic as outlined in QEI-1 Standard for the Qualification of Elevator Inspectors, as augmented by local code or regulation.

Inspection Actions

1. Verify the extent of inspections required in the reference sections listed above.
2. Inspect components and subcomponents according to the reference provided.
3. Report all deficiencies to the facility manager.

Special Tools and Equipment

Special tools required beyond those listed in the Standard Tool Section are at the discretion of the inspector. A guide list is found in Division 7 of the introduction to ASME 17.2.

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level I inspection.

References

1. ASME 17.2
2. QEI-1, Standard for the Qualification of Elevator Inspectors

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 16

COMPONENT: EQUIPMENT CONTROLS AND PANELS
CONTROL NUMBER: GS-III 06.01.08-16

Application

This guide applies to the investigation of elevator cab equipment control panels as described in parts of ASME 17.2, Divisions 100 and 101.

Special Safety Requirements

Special safety requirements needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section are listed in Division 4 of the introduction of ASME 17.2 and the specific section of that publication referred to in the text of this guide sheet. Proper conduct of this inspection requires a trained elevator mechanic as outlined in QEI-1 Standard for the Qualification of Elevator Inspectors, as augmented by local code or regulation.

Inspection Actions

1. Verify the extent of inspections required in the reference sections listed above.

2. Inspect components and subcomponents according to the reference provided.

3. Report all deficiencies to the facility manager.

Special Tools and Equipment

Special tools required beyond those listed in the Standard Tool Section are at the discretion of the inspector. A guide list is found in Division 7 of the introduction to ASME 17.2.

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level I inspection.

References

1. ASME 17.2

2. QEI-1, Standard for the Qualification of Elevator Inspectors

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 17

COMPONENT: EQUIPMENT CONTROLS AND PANELS
CONTROL NUMBER: GS-III 06.01.08-17

Application

This guide applies to the investigation of elevator service-level controls as described in parts of ASME 17.2 Divisions 100, 102, and 103.

Special Safety Requirements

Special safety requirements needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section are listed in Division 4 of the introduction of ASME 17.2 and the specific section of that publication referred to in the text of this guide sheet. Proper conduct of this inspection requires a trained elevator mechanic as outlined in QEI-1 Standard for the Qualification of Elevator Inspectors, as augmented by local code or regulation.

Inspection Actions

1. Verify the extent of inspections required in the reference sections listed above.

2. Inspect components and subcomponents according to the reference provided.

3. Report all deficiencies to the facility manager.

Special Tools and Equipment

Special tools required beyond those listed in the Standard Tool Section are at the discretion of the inspector. A guide list is found in Division 7 of the introduction to ASME 17.2.

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level I inspection.

References

1. ASME 17.2

2. QEI-1, Standard for the Qualification of Elevator Inspectors

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 18

COMPONENT: EQUIPMENT CONTROLS AND PANELS
CONTROL NUMBER: GS-III 06.01.08-18

Application

This guide applies to the investigation of main elevator control panels as described in parts of ASME 17.2, Division 104.

Special Safety Requirements

Special safety requirements needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section are listed in Division 4 of the introduction of ASME 17.2 and the specific section of that publication referred to in the text of this guide sheet. Proper conduct of this inspection requires a trained elevator mechanic as outlined in QEI-1 Standard for the Qualification of Elevator Inspectors, as augmented by local code or regulation.

Inspection Actions

1. Verify the extent of inspections required in the reference sections listed above.

2. Inspect components and subcomponents according to the reference provided.

3. Report all deficiencies to the facility manager.

Special Tools and Equipment

Special tools required beyond those listed in the Standard Tool Section are at the discretion of the inspector. A guide list is found in Division 7 of the introduction to ASME 17.2.

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level I inspection.

References

1. ASME 17.2

2. QEI-1, Standard for the Qualification of Elevator Inspectors

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 19

COMPONENT: PIPES AND FITTINGS
CONTROL NUMBER: GS-III 06.01.09-19

Application

This guide applies to the investigation of pipes and fittings as described in parts of ASME 17.2 Division 204.

Special Safety Requirements

Special safety requirements needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section are listed in Division 4 of the introduction of ASME 17.2 and the specific section of that publication referred to in the text of this guide sheet. Proper conduct of this inspection requires a trained elevator mechanic as outlined in QEI-1 Standard for the Qualification of Elevator Inspectors, as augmented by local code or regulation.

Inspection Actions

1. Verify the extent of inspections required in the reference sections listed above.

2. Inspect components and subcomponents according to the reference provided.

3. Report all deficiencies to the facility manager.

Special Tools and Equipment

Special tools required beyond those listed in the Standard Tool Section are at the discretion of the inspector. A guide list is found in Division 7 of the introduction to ASME 17.2.

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level I inspection.

References

1. ASME 17.2

2. QEI-1, Standard for the Qualification of Elevator Inspectors

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 20

COMPONENT: VALVES
CONTROL NUMBER: GS-III 06.01.10-20

Application

This guide applies to the investigation of valves as described in parts of ASME 17.2, Division 204.

Special Safety Requirements

Special safety requirements needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section are listed in Division 4 of the introduction of ASME 17.2 and the specific section of that publication referred to in the text of this guide sheet. Proper conduct of this inspection requires a trained elevator mechanic as outlined in QEI-1 Standard for the Qualification of Elevator Inspectors, as augmented by local code or regulation.

Inspection Actions

1. Verify the extent of inspections required in the reference sections listed above.
2. Inspect components and subcomponents according to the reference provided.
3. Report all deficiencies to the facility manager.

Special Tools and Equipment

Special tools required beyond those listed in the Standard Tool Section are at the discretion of the inspector. A guide list is found in Division 7 of the introduction to ASME 17.2.

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level I inspection.

References

1. ASME 17.2
2. QEI-1, Standard for the Qualification of Elevator Inspectors

06.02 TRACTION ELEVATORS

DESCRIPTION

Traction Elevators provide a means for conveyance between building or structure elevations. They use motor-driven sheaves, cables, and counterweights to raise and lower a cab. Primarily used for passenger service, these units are more sophisticated than hydraulic units, employing additional control equipment to provide smoother acceleration and faster transportation. The system includes the elevator cab, cables and counterweight assembly, a drive assembly, governor, miscellaneous hoistway apparatus, a motor-generator set, and equipment controls and panels.

SPECIAL TOOL AND EQUIPMENT REQUIREMENTS

None.

SPECIAL SAFETY REQUIREMENTS

Follow applicable safety requirements set forth in the Master Safety Manual and the Elevator Industry Field Employees' Safety Handbook as augmented by local requirements if more stringent.

COMPONENT LIST

- 06.02.01 ELEVATOR CAB
- 06.02.02 CABLES AND COUNTERWEIGHT
- 06.02.03 DRIVE ASSEMBLY
- 06.02.04 HOISTWAY APPARATUS
- 06.02.05 MOTOR GENERATOR SET
- 06.02.06 EQUIPMENT CONTROLS AND PANELS

RELATED SUBSYSTEMS

Due to the related nature of the elements requiring inspection, the following sections should be reviewed for relevant and concurrent inspection activities.

06.01	HYDRAULIC ELEVATORS
09.00	BUILDING FIRE PROTECTION
10.02	BUILDING ELECTRICAL (Low Voltage Dist. System 600 V or less)
10.03	LIGHTING
10.07	POWER SOURCES

06.02 TRACTION ELEVATORS

STANDARD INSPECTION PROCEDURE

Prior to performing a Level I inspection, the inspector(s) should review existing records including as-built drawings, records of periodic inspection and maintenance logs. Since many elevator systems are maintained by service contract, it may be necessary to review contractual documentation to determine the scope of maintenance services provided from that source. Level I inspections for each individual elevator system will include riding the elevator, inspecting the related components at each floor level or landing, and inspecting the machine rooms. Some elevators may have additional remote control panels in building lobbies or at security stations which have to be inspected as well. In some instances, such as ganged installations, more than one elevator system may share components. For example, the dispatching controls that direct elevator movement depending on which calls are received as related to the elevator position of each elevator at the time.

For Level I observations, the inspector will not enter the hoistway or pit for safety reasons. No top-of car inspections will be made. In addition, extreme care has to be taken to remain clear of moving parts associated with these systems because of the random nature of elevator movement. No interlocks will be disabled. All elevators will remain in service. With the exception of using the keyed controls designed for dedicated or fire service elevator operation, no control sequences will be initiated except those available to the general ridership. Inspection requires one person making a visual examination and taking some measurements. The inspection shall be carried out on the basis of individual elevator installations as previously defined. Defects are to be recorded on the data collection device (DCD).

Level II inspections may require opening of doors and simple overrides of elevator interlocks. The inspector may make visual observations of the pit or hoistway and top and bottom of car without entering the pit or hoistway. Control cabinets may be opened in the machine room. The same safety concerns listed for Level I inspections apply to Level II inspections.

Elevator-related Level III inspections require a trained elevator technician and helper. The inspection procedures and safety guidelines to be used are found in the reference material listed at the end of this section. Additional Level III inspections may be required to evaluate defects in elevator-related components such as those included in the electrical or fire protection systems, for instance.

06.02 TRACTION ELEVATORS

COMPONENTS

◆ 06.02.01 ELEVATOR CAB

Elevator cabs are classified by the service they provide: passenger, service or freight. Passenger elevator cabs generally have interior finishes, fittings, and lighting to compliment the character of the building. Ventilation is also provided. Doors tend to be double-panel, horizontally opening types. Control panels indicate floor levels.

Freight elevator cabs are usually made from heavy-duty steel components, without interior finish or fittings. Doors to these units are usually manually operated, screened or panel, vertical lift type to maximize opening size. Lighting schemes are simple.

Service elevator cabs, intended for double duty as passenger and light freight units, combine features of the previously described types of cabs, but must meet code for passenger cabs. To maintain vertical alignment in the shaft, all cabs have alignment guides (rollers or guide shoes) that slide along rails in the hoistway.

Cab Ride: The first activity in examining an elevator installation is to ride the cab while observing the quality of the ride. Use visual observation, hearing, sense of motion, and even your sense of smell to evaluate the quality of performance. Usually these observations indicate problems with components outside of the cab, including defective cab alignment devices. Other observations relate directly to the cab.

Leveling: The leveling action of the cab should be observed at all landings and approaching from each direction. All leveling motion should occur in the direction of elevator travel. Cab loading and load distribution can impact leveling accuracy. Frequent re-leveling, "hunting", overrun, or stopping the cab out of tolerance from level is considered a defect.

Door Operation: Elevator doors receive the heaviest use during operation. Wear and alignment problems, (See Appearance and Fastenings) and proper door opening and closing sequences must be checked. Doors must not open except at landings. Doors must not close when obstructions remain in the door opening. Doors must respond properly to the activation of on-cab controls.

Lighting: Lighting should be adequate and provided from more than one fixture. Light fixtures should be guarded from breakage and accidental contact. The emergency lighting must be provided from more than one bulb. The battery pack must be mounted on the cab.

Cab Appearance and Fastenings: The cab should be structurally sound. All finishes, including wall, ceiling and floor coverings, doors, and fastenings should be secure and not worn to the point of creating a hazard. Capacity plates and any additional data plates required should be in place. Moving parts, doors, etc., should operate as intended. Sagging floors, bowed panels, or separated joints are some indicators of structural damage or weakness.

Ventilation: Cab ventilation is mandated for passenger elevators. The ventilator is usually cab roof-mounted. For proper operation, the ventilator should run quietly and all associated vents should be clean from dust and should not be obstructed.

06.02 TRACTION ELEVATORS

COMPONENTS (Continued)

◆ 06.02.01 ELEVATOR CAB (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Cab Ride:**			
Observation:			
a. Vertical vibration, jerk or bounce during start-up or stop. ***{Severity M}	EA		1
b. Horizontal vibration, front-to-back, side-to-side. ***{Severity M}	EA		1
c. Noise. ***{Severity M}	EA		1
d. Electrical/burning odors. ***{Severity M}	EA		1

Defect:

*** Leveling:**			
Observation:			
a. Cab fails to level within ± 3/8 inch. ***{Severity L}	EA		2
b. Cab fails to level within ± 1/2 inch. ***{Severity M}	EA		2
c. Cab overruns the stops. ***{Severity M}	EA		2
d. Cab "hunts" (jockeys at a floor). ***{Severity H}	EA		2

Defect:

*** Door Operation:**			
Observation:			
a. Cab doors fail to re-open for obstruction. ***{Severity H}	EA		3
b. Cab door fails to respond to Door Open Button. ***{Severity H}	EA		3
c. Nudging fails to work for door forced open. ***{Severity H}	EA		3
d. Door-blocked alarm fails to sound. ***{Severity H}	EA		3
e. Door can open with cab outside landing zone. ***{Severity H}	EA		3

06.02 TRACTION ELEVATORS

COMPONENTS (Continued)

◆ 06.02.01 ELEVATOR CAB (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Lighting:**			
Observation:			
a. Cab lighting inadequate.	EA		4
***{Severity M}			
b. Cab emergency lighting inadequate.	EA		4
***{Severity M}			
Defect:			
*** Ventilation:**			
Observation:			
a. Vent motor noisy.	EA	1	5
***{Severity L}			
b. Vents dirty or blocked.	EA	1	5
***{Severity L}			
c. Vent motor not operating.	EA	1	5
***{Severity M}			
Defect:			
*** Cab Fastenings:**			
Observation:			
a. Panels not secure.	EA		
***{Severity M}			
b. Handrails or other fixtures not secure.	EA		
***{Severity M}			
c. Required signage missing.	EA		
***{Severity M}			
d. Required capacity plate missing.	EA		
***{Severity M}			
e. Cab wall finishes damaged.	SF		
***{Severity M }			
f. Cab ceiling finishes damaged.	SF		
***{Severity M }			
g. Cab floor finishes damaged.	SF		
***{Severity M}			
h. Door hangars loose, bent or damaged.	EA		5
***{Severity M}			
i. Sills worn.	LF		
***{Severity M}			
j. Door operation restricted.	EA		5
***{Severity H}			
k. Evidence of structural damage or weakness.	EA		5
***{Severity H}			

06.02 TRACTION ELEVATORS

COMPONENTS (Continued)

◆ 06.02.02 CABLES AND COUNTERWEIGHTS

Multiple cables are used to lift and lower the cab. They are attached on one end to sockets on the top of the cab and on the other end to a set of counterweights. The cables pass over the main drive sheave, which provides the driving force to raise the cab. The counterweights are generally cast iron plates mounted in a rack. Because they serve to counter the weight of the cab itself, very little force is actually required to move the cab. Variations in the above cabling descriptions can be found using additional pulleys and threading arrangements. These include 2:1 roping, double wrapping, and underslung roping. Load compensation cables are sometimes used to offset the effect of cable weight in large buildings. These are attached to the bottom of the cab and to the lower end of the counterweight and pass through a load compensator in the elevator pit. Like cabs, the counterweights have an alignment device attached, consisting of guide shoes or rollers, that slides over rails in the hoistway, maintaining vertical alignment in the shaft.

These features require observation from the hoistway, (usually accomplished by riding the top of the cab), the pit, or the machine room. Because of the inherent danger, these observations should be accomplished only by trained elevator mechanics. For the purpose of this evaluation, secondary indicators must be used. A bumpy ride, vibrations, noise all indicate that some equipment in the hoistway may be worn or misaligned. The most recent elevator inspection results and record of maintenance since that periodic inspection can serve as indicators of the condition of items that cannot be evaluated directly.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Cable/Counterweight Condition:**			
Observation:			
a. Loose or missing fasteners. ***{Severity M}	EA		6
b. Counterweight guides/rollers worn. ***{Severity M}	EA		6
c. Counterweight damaged. ***{Severity M}	EA		6
d. Compensator worn or damaged. ***{Severity M}	EA		6
e. Excessive cable wear. ***{Severity H}	LF		6
f. Cable damaged/frayed/distorted ***{Severity H}	LF		6

06.02 TRACTION ELEVATORS

COMPONENTS (Continued)

◆ 06.02.03 DRIVE ASSEMBLY

Drive assemblies are classified as geared or gearless. Gearless drives are used in medium-to-high speed operations. The main drive assembly in a gearless unit consists of the drive motor, drive sheaves, and a brake mounted generally on a common shaft and supported on a single frame. Geared machines are used for slow-speed (less than 350 gpm) operations. In a geared drive, the motor, brake assembly, and a worm gear are mounted on one shaft, and a helix gear and sheave are mounted on another.

The drive motor on a gearless machine is always a DC unit and may be open or closed. However, a geared machine may be AC or DC. For smooth acceleration and general speed control, a DC unit is preferred in most instances.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Drive Assembly Inoperable:**			
Observation:			
a. Shaft locked.	EA		7
***{Severity H}			
b. Worn or damaged gears.	EA		7
***{Severity H}			
Defect:			
*** Sheave Damaged:**			
Observation:			
a. Worn unequally.	EA		7
***{Severity M}			
b. Broken or cracked.	EA		7
***{Severity H}			
Defect:			
*** Excessive Noise or Vibration:**			
Observation:			
a. Wear imbalance.	EA		7
***{Severity M}			
b. Misalignment.	EA		7
***{Severity M}			

06.02 TRACTION ELEVATORS

COMPONENTS (Continued)

◆ 06.02.03 DRIVE ASSEMBLY (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Corrosion:**			
Observation:			
a. Surface corrosion (no pitting evident). ***{Severity L}	SF		7
b. Corrosion evidenced by pitting or blistering. ***{Severity M}	SF		7
c. Corrosion evidenced by holes or loss of base metal. ***{Severity M}	EA		7

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Seal Leakage:**			
Observation:			
a. Seal weeps. ***{Severity L}	EA		7
b. Seal leaks. ***{Severity M}	EA		7

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Defective Bearing:**			
Observation:			
a. Bearing is noisy (loose or damaged). ***{Severity M}	EA		7
b. Bearing runs hot (improperly lubricated). ***{Severity M}	EA		7

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Brake Drum Deficiencies:**			
Observation:			
a. Improper adjustment. ***{Severity L}	EA		7
b. Brake pads worn. ***{Severity M}	EA		7
c. Oil covered or dirty. ***{Severity H}	EA		7
d. Assembly damaged. ***{Severity H}	EA		7

06.02 TRACTION ELEVATORS

COMPONENTS (Continued)

◆ 06.02.04 HOISTWAY APPARATUS

There are four major assemblies in the hoistway: guide rails, hoistway doors, the governor, and buffers. The hoistway also contains some control switches and sensors which are listed under 06.02.06, Equipment Controls and Panels.

These features require observation from the hoistway (usually accomplished by riding the top of the cab) and from the pit. Because of the inherent danger, these observations should be accomplished only by trained elevator mechanics. For the purpose of this evaluation, secondary indicators must be used. A bumpy ride, vibrations, noise all indicate that some equipment in the hoistway may be worn or misaligned. The most recent elevator inspection results and record of maintenance since the last inspection can serve as an indicator of the condition of items that cannot be evaluated directly.

Guide Rails: Guide rails are installed on both sides of the cab to control vertical alignment. They are normally bracket-mounted to the hoistway surface. Examination will include wear, alignment and fastening.

Hoistway Doors: Each level of access is protected by a hoistway door. For passenger elevators, they are motorized for ease of operation, and are similar to horizontal-motion cab doors. For freight elevators, the hoistway door is typically of double panel, vertical motion design. The lower half drops below floor level, the upper half raises for maximum access.

Governor: Various governor assemblies are used to monitor and limit cab speed. A single cable, attached to the cab and over a sheave, is frequently used to activate a set of flyweights. Excessive cab speed causes the flyweights to trip an electrical switch, shutting off the drive motor and engaging the braking circuit. If cab motion continues to increase, a set of jaws mounted on the cab will engage the guide rails, bringing the cab to a gradual stop.

Buffers: Buffers are installed in the elevator pit to cushion cab stopping if it over-travels the lower limits. These units are either springs or oil-filled dampers.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Guide Rails:**			
Observation:			
a. Guide rails worn.	LF		8
***{Severity H}			
b. Loose or missing fasteners.	EA		8
***{Severity H}			
c. Guide rails out of alignment.	LF		8
***{Severity H}			

06.02 TRACTION ELEVATORS

COMPONENTS (Continued)

◆ 06.02.04 HOISTWAY APPARATUS (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Hoistway Doors:**			
Observation:			
a. Loose or missing fasteners. ***{Severity M}	EA		8
b. Hoistway doors damaged. ***{Severity M}	EA		8
c. Hoistway doors inoperable. ***{Severity H}	EA		8
d. Gate slats broken. ***{Severity H}	EA		8
e. Gate strap missing. ***{Severity H}	EA		8
f. Gate safety interlocks inoperable. ***{Severity H}	EA		8

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Governor:**			
Observation:			
a. Excessive governor cable wear. ***{Severity H}	LF		9
b. Governor cable damage. ***{Severity H}	LF		9

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Buffers:**			
Observation:			
a. Oil level low or leakage. ***{Severity L}	EA		10
b. Cab and/or counterweight hits buffer during normal operations. ***{Severity H}	EA		10
c. Buffer damaged or misaligned. ***{Severity H}	EA		10
d. Buffer spring broken or distorted. ***{Severity H}	EA		10

06.02 TRACTION ELEVATORS

COMPONENTS (Continued)

◆ 06.02.05 MOTOR GENERATOR SET

All gearless machines and those geared machines that use DC power require a motor-generator (M-G) set to provide the power conversion. The M-G set is normally located in the elevator equipment room.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
* **Corrosion:**			
Observation:			
a. Surface corrosion (no pitting evident). ***{Severity L}	SF		11
b. Corrosion evidenced by pitting or blistering. ***{Severity M}	SF		11
c. Corrosion evidenced by holes or loss of base metal. ***{Severity H}	EA		11

Defect:

* **Housekeeping:**			
Observation:			
a. Motor housings contaminated. ***{Severity L}	EA		11
b. Machine air passage dirty or clogged. ***{Severity M}	EA		

Defect:

* **Structure:**			
Observation:			
a. Motor frame cracked or broken. ***{Severity M}	EA		11
b. Motor support cracked or broken. ***{Severity M}	EA		11
c. Motor support shifted. ***{Severity M}	EA		11
d. Defective mounting pads. ***{Severity M}	EA		11
e. Loose or missing mounting bolts. ***{Severity H}	EA		11

06.02 TRACTION ELEVATORS

COMPONENTS (Continued)

◆ 06.02.05 MOTOR GENERATOR SET (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Motor Operation:**			
Observation:			
a. Excessively noisy. ***{Severity L}	EA		12
b. Excessive vibration. ***{Severity M}	EA		12
c. Excessive sparking at the collector rings, commutator, or brushes. ***{Severity M}	EA		13

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Power Connections:**			
Observation:			
a. Terminal box cover missing. ***{Severity L}	EA	2	
b. Insulation of motor leads damaged or deteriorated. ***{Severity M}	EA	2	
c. Taping improperly installed or deteriorated. ***{Severity M}	EA	2	
d. Unit not grounded. ***{Severity H}	EA	2	

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Hot Spots:**			
Observation :			
a. Terminal 5° to 24°C above ambient. ***{Severity M}	EA	3	14
b. Terminal 25° or more 25° or more above ambient. ***{Severity H}	EA	3	14

06.02 TRACTION ELEVATORS

COMPONENTS (Continued)

◆ 06.02.06 EQUIPMENT CONTROLS AND PANELS

Control panels are provided in the cab, at all service levels, and on the main unit. The cab panel includes switches for floor selection, lighting control, manual override, and cab alarms. Modern units include an emergency phone, intercom and may have a TV camera for security.

Selector switches and indicators at each service level indicate service requests and cab status. Hoistway doors employ safety devices such as photocells and/or safety strips to detect door blockage. The hoistway and cab contain equipment positioning and safety controls: floor stop and limit switches, and cab gate switches. These are interlocked to prevent operation with open doors and to prevent door opening unless the cab is properly positioned.

The main control panel includes a motor controller, limit relays, and overload devices. Where multiple cabs are included, scheduling (dispatching) controls are also included.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** In-Cab Controls and Signals:**			
Observation:			
a. Call buttons fail to illuminate. ***{Severity L }	EA		15
b. Handicapped markings not in place. ***{Severity M }	EA		15
c. Cab position indicator not operating. ***{Severity M}	EA		15
d. Alarm bell not audible in lobby/watch station. ***{Severity M }	EA		15
e. Stop switch fails to engage alarm. ***{Severity M }	EA		15
f. Intercom inoperable. ***{Severity M }	EA		15
g. Firefighters (Emergency) switch inoperable. ***{Severity M}	EA		15
h. Independent service controls inoperable. ***{Severity M}	EA		15
i. Alarm bell not working. ***{Severity H}	EA		15
j. Alarm bell not audible in cab. ***{Severity H}	EA		15
k. Telephone inoperable. ***{Severity H}	EA		15
l. Closed circuit TV inoperable. ***{Severity H }	EA		15

06.02 TRACTION ELEVATORS

COMPONENTS (Continued)

◆ 06.02.06 CONTROLS AND PANELS (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Service-level Controls:**			
Observation:			
a. Call button indicators will not light. ***{Severity L}	EA		16
b. Floor indicators (lanterns) fail to light. ***{Severity L}	EA		16
c. Gong fails to sound. ***{Severity L }	EA		16
d. Call buttons inoperable. ***{Severity M }	EA		16
e. Door interlocks inoperable. ***{Severity H}	EA		16

Defect:

*** Main Control:**			
Observation:			
a. Units dirty. ***{Severity M}	EA		17
b. Housing corroded. ***{Severity M}	EA		17
c. Wiring frayed or burned. ***{Severity M }	EA		17
d. Relays pitted or burned. ***{Severity H }	EA		17
e. Indications of overheating. ***{Severity H}	EA		17

06.02 TRACTION ELEVATORS

REFERENCES

1. Applicable jurisdictional regulations as required

2. ANSI/CABO A117.1-1992 Building and Facilities - Providing Accessibility and Usability for Physically Handicapped People

3. ANSI/ASME A17.1 Safety Code for Elevators and Escalators, latest edition

4. ANSI/ASME A17.2 Inspectors' Manual for Elevators and Escalators, latest edition

5. Elevator Industry Field Employees' Safety Handbook, latest edition
(Available from Elevator World, PO Box 6507, Mobile AL 36606)

6. Master Safety Manual, Fluor Daniel

06.02 TRACTION ELEVATORS

LEVEL II KEY	GUIDE SHEET CONTROL NUMBER
1	GS-II 06.02.01-1
2	GS-II 06.02.05-2
3	GS-II 06.02.05-3

LEVEL III KEY	GUIDE SHEET CONTROL NUMBER
1	GS-III 06.02.01- 1
2	GS-III 06.02.01- 2
3	GS-III 06.02.01- 3
4	GS-III 06.02.01- 4
5	GS-III 06.02.01- 5
6	GS-III 06.02.02- 6
7	GS-III 06.02.03- 7
8	GS-III 06.02.04- 8
9	GS-III 06.02.04- 9
10	GS-III 06.02.04-10
11	GS-III 06.02.05-11
12	GS-III 06.02.05-12
13	GS-III 06.02.05-13
14	GS-III 06.02.05-14
15	GS-III 06.02.06-15
16	GS-III 06.02.06-16
17	GS-III 06.02.06-17

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 1

COMPONENT: ELEVATOR CAB
CONTROL NUMBER: GS-II 06.02.01-1

Application

This guide applies to the investigation of the inside of an enclosure, containing bare, energized, electrical parts.

Special Safety Requirements

The following list of special safety requirements, beyond the requirements listed in the Master Safety Plan and System Safety Section, are to be observed in the performance of this inspection.

1. This inspection guide applies to enclosures containing live electrical parts having a potential of 600 volts or less above ground. If the enclosure contains circuitry of higher potential, do not use this inspection guide.

2. Any enclosure that is padlocked for safety reason is not to be opened unless okayed by the person having control of the key.

3. Inspector needs to carefully open, inspect the inside and close the enclosure without shutting down the equipment, and without creating a hazard to himself.

Inspection Actions

1. Open panels or doors carefully as required for doing the visual inspection.

2. Visually inspect for those physical damaged defects that are listed and tagged Level II Key No. as indicated above.

3. Close panels or doors carefully after the inspection is completed.

Recommended Inspection Frequency

Do a Level II inspection each time a Level I inspection indicates one is required.

References

1. Sverdrup Corporation

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 2

COMPONENT: MOTOR GENERATOR SET
CONTROL NUMBER: GS-II 06.02.05-2

Application

This guide applies to the investigation of the inside of an enclosure, containing bare, energized, electrical parts.

Special Safety Requirements

The following list of special safety requirements, beyond the requirements listed in the Master Safety Plan and System Safety Section, are to be observed in the performance of this inspection.

1. This inspection guide applies to enclosures containing live electrical parts having a potential of 600 volts or less above ground. If the enclosure contains circuitry of higher potential, do not use this inspection guide.

2. Any enclosure that is padlocked for safety reason is not to be opened unless okayed by the person having control of the key.

3. Inspector needs to carefully open, inspect the inside and close the enclosure without shutting down the equipment, and without creating a hazard to himself.

Inspection Actions

1. Open panels or doors carefully as required for doing the visual inspection.

2. Visually inspect for those physical damaged defects that are listed and tagged Level II Key No. as indicated above.

3. Close panels or doors carefully after the inspection is completed.

Recommended Inspection Frequency

Do a Level II inspection each time a Level I inspection indicates one is required.

References

1. Sverdrup Corporation

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 3

COMPONENT: MOTOR GENERATOR SET
CONTROL NUMBER: GS-II 06.02.05-3

Application

This guide applies to the investigation of the inside of an enclosure, containing bare, energized, electrical parts.

Special Safety Requirements

The following list of special safety requirements, beyond the requirements listed in the Master Safety Plan and System Safety Section, are to be observed in the performance of this inspection.

1. This inspection guide applies to enclosures containing live electrical parts having a potential of 600 volts or less above ground. If the enclosure contains circuitry of higher potential, do not use this inspection guide.

2. Any enclosure that is padlocked for safety reason is not to be opened unless okayed by the person having control of the key.

3. Inspector needs to carefully open, inspect the inside and close the enclosure without shutting down the equipment, and without creating a hazard to himself.

Inspection Actions

1. Open panels or doors carefully and to the degree required for scanning those devices being tested.

2. Make temperature measurements with an infrared scanner.

3. Measure the ambient temperature by measuring a spot on the inside of the enclosure that is least effected by any internal panel heat source.

4. Measure the temperature of the device specified.

5. Above ambient temperature is calculated by subtracting the ambient temperature from the device temperature.

6. Record the results.

7. Close panels or doors carefully after the inspection is complete.

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 3 (Continued)

COMPONENT: MOTOR GENERATOR SET
CONTROL NUMBER: GS-II 06.02.05-3

Recommended Inspection Frequency

Do a Level II inspection each time a Level I inspection is made.

References

1. Maintenance Technology/September 1993; Write-up Title: "Infrared Keeps All Systems Go"

2. Raining - Agema Infrared Systems; "Measurement of Excess Temperatures with Infrared Scanners"

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 1

COMPONENT: ELEVATOR CAB
CONTROL NUMBER: GS-III 06.02.01-1

Application

This guide applies to the investigation of cab ride as described in ASME 17.2 and Elevator World's Guide to Elevatoring Section 7, pp 221-225.

Special Safety Requirements

Special safety requirements needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section are listed in Division 4 of the introduction of ASME 17.2 and the specific section of that publication referred to in the text of this guide sheet. Proper conduct of this inspection requires a trained elevator mechanic as outlined in QEI-1 Standard for the Qualification of Elevator Inspectors, as augmented by local code or regulation.

Inspection Actions

1. Verify the extent of inspections required in the reference sections listed above.
2. Inspect components and subcomponents according to the reference provided.
3. Report all deficiencies to the facility manager.

Special Tools and Equipment

Special tools required beyond those listed in the Standard Tool Section are at the discretion of the inspector. A guide list is found in Division 7 of the introduction to ASME 17.2.

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level I inspection.

References

1. ASME 17.2
2. QEI-1, Standard for the Qualification of Elevator Inspectors
3. Elevator World's Guide to Elevatoring Section 7

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 2

COMPONENT: ELEVATOR CAB
CONTROL NUMBER: GS-III 06.02.01-2

Application

This guide applies to the investigation of cab leveling accuracy as described in ASME 17,2 Divisions 100 and 103.

Special Safety Requirements

Special safety requirements needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section are listed in Division 4 of the introduction of ASME 17.2 and the specific section of that publication referred to in the text of this guide sheet. Proper conduct of this inspection requires a trained elevator mechanic as outlined in QEI-1 Standard for the Qualification of Elevator Inspectors, as augmented by local code or regulation.

Inspection Actions

1. Verify the extent of inspections required in the reference sections listed above.

2. Inspect components and subcomponents according to the reference provided.

3. Report all deficiencies to the facility manager.

Special Tools and Equipment

Special tools required beyond those listed in the Standard Tool Section are at the discretion of the inspector. A guide list is found in Division 7 of the introduction to ASME 17.2.

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level II inspection.

References

1. ASME 17.2

2. QEI-1, Standard for the Qualification of Elevator Inspectors

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 3

COMPONENT: ELEVATOR CAB
CONTROL NUMBER: GS-III 06.02.01-3

Application

This guide applies to the investigation of cab door operation as described in ASME 17.2 Divisions 100 and 101.

Special Safety Requirements

Special safety requirements needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section are listed in Division 4 of the introduction of ASME 17.2 and the specific section of that publication referred to in the text of this guide sheet. Proper conduct of this inspection requires a trained elevator mechanic as outlined in QEI-1 Standard for the Qualification of Elevator Inspectors, as augmented by local code or regulation.

Inspection Actions

1. Verify the extent of inspections required in the reference sections listed above.

2. Inspect components and subcomponents according to the reference provided.

3. Report all deficiencies to the facility manager.

Special Tools and Equipment

Special tools required beyond those listed in the Standard Tool Section are at the discretion of the inspector. A guide list is found in Division 7 of the introduction to ASME 17.2.

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level I inspection.

References

1. ASME 17.2

2. QEI-1, Standard for the Qualification of Elevator Inspectors

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 4

COMPONENT: ELEVATOR CAB
CONTROL NUMBER: GS-III 06.02.01-4

Application

This guide applies to the investigation of elevator cab lighting as described in ASME 17.2 Division 101, Item 101.1.

Special Safety Requirements

Special safety requirements needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section are listed in Division 4 of the introduction of ASME 17.2 and the specific section of that publication referred to in the text of this guide sheet. Proper conduct of this inspection requires a trained elevator mechanic as outlined in QEI-1 Standard for the Qualification of Elevator Inspectors, as augmented by local code or regulation.

Inspection Actions

1. Verify the extent of inspections required in the reference sections listed above.

2. Inspect components and subcomponents according to the reference provided.

3. Report all deficiencies to the facility manager.

Special Tools and Equipment

Special tools required beyond those listed in the Standard Tool Section are at the discretion of the inspector. A guide list is found in Division 7 of the introduction to ASME 17.2.

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level I inspection.

References

1. ASME 17.2

2. QEI-1, Standard for the Qualification of Elevator Inspectors

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 5

COMPONENT: ELEVATOR CAB
CONTROL NUMBER: GS-III 06.02.01-5

Application

This guide applies to the investigation of cab appearance, fastenings and ventilation as described in ASME 17.2, Division 101.

Special Safety Requirements

Special safety requirements needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section are listed in Division 4 of the introduction of ASME 17.2 and the specific section of that publication referred to in the text of this guide sheet. Proper conduct of this inspection requires a trained elevator mechanic as outlined in QEI-1 Standard for the Qualification of Elevator Inspectors, as augmented by local code or regulation.

Inspection Actions

1. Verify the extent of inspections required in the reference sections listed above.
2. Inspect components and subcomponents according to the reference provided.
3. Report all deficiencies to the facility manager.

Special Tools and Equipment

Special tools required beyond those listed in the Standard Tool Section are at the discretion of the inspector. A guide list is found in Division 7 of the introduction to ASME 17.2.

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level I inspection.

References

1. ASME 17.2
2. QEI-1, Standard for the Qualification of Elevator Inspectors

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 6

COMPONENT: CABLES AND COUNTERWEIGHTS
CONTROL NUMBER: GS-III 06.02.02-6

Application

This guide applies to the investigation of cables and counterweights as described in ANSI 17.2 Division 103.

Special Safety Requirements

Special safety requirements needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section are listed in Division 4 of the introduction of ASME 17.2 and the specific section of that publication referred to in the text of this guide sheet. Proper conduct of this inspection requires a trained elevator mechanic as outlined in QEI-1 Standard for the Qualification of Elevator Inspectors, as augmented by local code or regulation.

Inspection Actions

1. Verify the extent of inspections required in the reference sections listed above.
2. Inspect components and subcomponents according to the reference provided.
3. Report all deficiencies to the facility manager.

Special Tools and Equipment

Special tools required beyond those listed in the Standard Tool Section are at the discretion of the inspector. A guide list is found in Division 7 of the introduction to ASME 17.2.

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level I or Level II inspection.

References

1. ASME 17.2
2. QEI-1, Standard for the Qualification of Elevator Inspectors

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 7

COMPONENT: DRIVE ASSEMBLY
CONTROL NUMBER: GS-III 06.02.03-7

Application

This guide applies to the investigation of all elevator drive assembly subcomponents as described in ASME 17.2 Division 104.

Special Safety Requirements

Special safety requirements needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section are listed in Division 4 of the introduction of ASME 17.2 and the specific section of that publication referred to in the text of this guide sheet. Proper conduct of this inspection requires a trained elevator mechanic as outlined in QEI-1 Standard for the Qualification of Elevator Inspectors, as augmented by local code or regulation.

Inspection Actions

1. Verify the extent of inspections required in the reference sections listed above.
2. Inspect components and subcomponents according to the reference provided.
3. Report all deficiencies to the facility manager.

Special Tools and Equipment

Special tools required beyond those listed in the Standard Tool Section are at the discretion of the inspector. A guide list is found in Division 7 of the introduction to ASME 17.2.

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level I inspection.

References

1. ASME 17.2
2. QEI-1, Standard for the Qualification of Elevator Inspectors

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 8

COMPONENT: HOISTWAY APPARATUS
CONTROL NUMBER: GS-III 06.02.04-8

Application

This guide applies to the investigation of hoistway guide rails and hoistway doors as described in parts of ASME 17.2, Division 103.

Special Safety Requirements

Special safety requirements needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section are listed in Division 4 of the introduction of ASME 17.2 and the specific section of that publication referred to in the text of this guide sheet. Proper conduct of this inspection requires a trained elevator mechanic as outlined in QEI-1 Standard for the Qualification of Elevator Inspectors, as augmented by local code or regulation.

Inspection Actions

1. Verify the extent of inspections required in the reference sections listed above.

2. Inspect components and subcomponents according to the reference provided.

3. Report all deficiencies to the facility manager.

Special Tools and Equipment

Special tools required beyond those listed in the Standard Tool Section are at the discretion of the inspector. A guide list is found in Division 7 of the introduction to ASME 17.2.

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level I inspection.

References

1. ASME 17.2

2. QEI-1, Standard for the Qualification of Elevator Inspectors

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 9

COMPONENT: HOISTWAY APPARATUS
CONTROL NUMBER: GS-III 06.02.04-9

Application

This guide applies to the investigation of governors as described in parts of ASME 17.2, Division 103 and 104.

Special Safety Requirements

Special safety requirements needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section are listed in Division 4 of the introduction of ASME 17.2 and the specific section of that publication referred to in the text of this guide sheet. Proper conduct of this inspection requires a trained elevator mechanic as outlined in QEI-1 Standard for the Qualification of Elevator Inspectors, as augmented by local code or regulation.

Inspection Actions

1. Verify the extent of inspections required in the reference sections listed above.

2. Inspect components and subcomponents according to the reference provided.

3. Report all deficiencies to the facility manager.

Special Tools and Equipment

Special tools required beyond those listed in the Standard Tool Section are at the discretion of the inspector. A guide list is found in Division 7 of the introduction to ASME 17.2.

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level I inspection.

References

1. ASME 17.2

2. QEI-1, Standard for the Qualification of Elevator Inspectors

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 10

COMPONENT: HOISTWAY APPARATUS
CONTROL NUMBER: GS-III 06.02.04-10

Application

This guide applies to the investigation of buffers as described in parts of ASME 17.2, Divisions 105.

Special Safety Requirements

Special safety requirements needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section are listed in Division 4 of the introduction of ASME 17.2 and the specific section of that publication referred to in the text of this guide sheet. Proper conduct of this inspection requires a trained elevator mechanic as outlined in QEI-1 Standard for the Qualification of Elevator Inspectors, as augmented by local code or regulation.

Inspection Actions

1. Verify the extent of inspections required in the reference sections listed above.
2. Inspect components and subcomponents according to the reference provided.
3. Report all deficiencies to the facility manager.

Special Tools and Equipment

Special tools required beyond those listed in the Standard Tool Section are at the discretion of the inspector. A guide list is found in Division 7 of the introduction to ASME 17.2.

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level I inspection.

References

1. ASME 17.2
2. QEI-1, Standard for the Qualification of Elevator Inspectors

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 11

COMPONENT: MOTOR GENERATOR SET
CONTROL NUMBER: GS-III 06.02.05-11

Application

This guide applies to the investigation of motor generator sets as described in ASME 17.2, Division 104.

Special Safety Requirements

Special safety requirements needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section are listed in Division 4 of the introduction of ASME 17.2 and the specific section of that publication referred to in the text of this guide sheet. Proper conduct of this inspection requires a trained elevator mechanic as outlined in QEI-1 Standard for the Qualification of Elevator Inspectors, as augmented by local code or regulation.

Inspection Actions

1. Verify the extent of inspections required in the reference sections listed above.
2. Inspect components and subcomponents according to the reference provided.
3. Report all deficiencies to the facility manager.

Special Tools and Equipment

Special tools required beyond those listed in the Standard Tool Section are at the discretion of the inspector. A guide list is found in Division 7 of the introduction to ASME 17.2.

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level I inspection.

References

1. ASME 17.2
2. QEI-1, Standard for the Qualification of Elevator Inspectors

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 12

COMPONENT: MOTOR GENERATOR SET
CONTROL NUMBER: GS-III 06.02.05-12

Application

This guide applies to the investigation of electrical motors having excessive noise or vibration symptoms.

Special Safety Requirements

No special safety requirements are needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section.

Inspection Actions

1. Verify the findings of Level I inspection by using the vibration/sound level meter and measure the velocity (inches/second, peak), displacement (mils, peak-peak) and noise (db). Compare reading with acceptable manufacturer tolerances.
2. Inspect bearings for defects or dryness.
3. Inspect electrical motor and load unit for misalignment.
4. Inspect electrical motor and load unit for proper mounting.
5. Inspect electrical motor and load unit for transfer of vibration from another source.
6. Inspect coupling for loose connection.
7. If none of the above is the problem, reference manufacturer troubleshooting guide for additional inspections or repairs to be made.

Special Tools and Equipment

The following is a list of special tools required beyond those listed in the Standard Tool Section.

1. Vibration/sound level meter, IDR Mechanalysis #1TC87

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 12 (Continued)

COMPONENT: MOTOR GENERATOR SET
CONTROL NUMBER: GS-III 06.02.05-12

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level I inspection.

References

1. KATO Engineering, Instruction Manual for Brushless Revolving Field Alternating Current Generators

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 13

COMPONENT: MOTOR GENERATOR SET
CONTROL NUMBER: GS-III 06.02.05-13

Application

This guide applies to the investigation of excessive sparking at the collector rings, commutator or brushes.

Special Safety Requirements

No special safety requirements are needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section.

Inspection Actions

Level I Inspector will detect excessive sparking in the area of either the collector rings, commutator or brushes. Level III Inspector will perform the following tasks.

1. Verify that there is excessive sparking in the area of either the collector rings, commutator or brushes.

2. If there is a problem, stop the motor and evaluate the problems causing the sparking.

3. Classify the severity of the problem and recommend the procedure needed to correct the problem.

4. If the Level III Inspector can not evaluate the problem, recommend the next procedure required to further identify the correction procedure that needs to be followed.

Special Tools and Equipment

The following is a list of special tools required beyond those listed in the Standard Tool Section.

1. Wrenches

2. Feelers

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 13 (Continued)

COMPONENT: MOTOR GENERATOR SET
CONTROL NUMBER: GS-III 06.02.05-13

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level I inspection.

References

1. "Handbook of Building and Plant Maintenance, Forms and Checklists" by Roger W. Liska and Judith Morrison Liska

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 14

COMPONENT: MOTOR GENERATOR SET
CONTROL NUMBER: GS-III 06.02.05-14

Application

This guide applies to the investigation of a hot terminal or device that is overheating from the flow of current through that terminal or device.

Special Safety Requirements

No special safety requirements are needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section.

Inspection Actions

1. Verify the findings of Level II inspection by using the Infrared Scanner and measuring the temperatures of the device and terminals. If the device or terminals are not hot as indicated by the findings of Level inspection, check the current flow through the device or terminals. Heat generated is proportionate to the square of the current. If there is little or no current flow through the device or terminal at the time of measurement, there will be no significant amount of heat generated.

2. For terminal connections, verify the type of conductor being terminated. If the conductor is an aluminum conductor, look for evidence of cold flow or melt down of conductor.

3. If there is evidence of cold flow or melt down of the aluminum conductor, the conductor should either be replaced or shortened and reconnected. When making new aluminum conductor terminations a joint compound should be used.

4. If the terminal is loose it should be tightened. De-energize prior to attempting tightening of terminal connections.

5. If none of the above is the problem than there is an internal problem and an on-site analysis must be made to determine if additional inspections are to be made or the unit is to be replaced.

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 14 (Continued)

COMPONENT: MOTOR GENERATOR SET
CONTROL NUMBER: GS-III 06.02.05-14

Special Tools and Equipment

The following is a list of special tools required beyond those listed in the Standard Tool Section.

1. Infrared Scanner, Raytek, Inc., #PM2EM-L2
2. Torque wrench
3. Digital Multimeter, Fluke #1TC676

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level II inspection.

References

1. Maintenance Technology/September 1993; Write-up Title: Infrared Keeps All Systems Go
2. Raining - Agema Infrared Systems; Measurement of Excess Temperatures with Infrared Scanners

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 15

COMPONENT: EQUIPMENT CONTROLS AND PANELS
CONTROL NUMBER: GS-III 06.02.06-15

Application

This guide applies to the investigation of elevator cab equipment control panels as described in parts of ASME 17.2, Divisions 100 and 101.

Special Safety Requirements

Special safety requirements needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section are listed in Division 4 of the introduction of ASME 17.2 and the specific section of that publication referred to in the text of this guide sheet. Proper conduct of this inspection requires a trained elevator mechanic as outlined in QEI-1 Standard for the Qualification of Elevator Inspectors, as augmented by local code or regulation.

Inspection Actions

1. Verify the extent of inspections required in the reference sections listed above.
2. Inspect components and subcomponents according to the reference provided.
3. Report all deficiencies to the facility manager.

Special Tools and Equipment

Special tools required beyond those listed in the Standard Tool Section are at the discretion of the inspector. A guide list is found in Division 7 of the introduction to ASME 17.2.

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level I inspection.

References

1. ASME 17.2
2. QEI-1, Standard for the Qualification of Elevator Inspectors

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 16

COMPONENT: EQUIPMENT CONTROLS AND PANELS
CONTROL NUMBER: GS-III 06.02.06-16

Application

This guide applies to the investigation of elevator service-level controls as described in parts of ASME 17.2 Divisions 100, 102, and 103.

Special Safety Requirements

Special safety requirements needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section are listed in Division 4 of the introduction of ASME 17.2 and the specific section of that publication referred to in the text of this guide sheet. Proper conduct of this inspection requires a trained elevator mechanic as outlined in QEI-1 Standard for the Qualification of Elevator Inspectors, as augmented by local code or regulation.

Inspection Actions

1. Verify the extent of inspections required in the reference sections listed above.
2. Inspect components and subcomponents according to the reference provided.
3. Report all deficiencies to the facility manager.

Special Tools and Equipment

Special tools required beyond those listed in the Standard Tool Section are at the discretion of the inspector. A guide list is found in Division 7 of the introduction to ASME 17.2.

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level I inspection.

References

1. ASME 17.2
2. QEI-1, Standard for the Qualification of Elevator Inspectors

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 17

COMPONENT: EQUIPMENT CONTROLS AND PANELS
CONTROL NUMBER: GS-III 06.02.06-17

Application

This guide applies to the investigation of main elevator control panels as described in parts of ASME 17.2, Division 104.

Special Safety Requirements

Special safety requirements needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section are listed in Division 4 of the introduction of ASME 17.2 and the specific section of that publication referred to in the text of this guide sheet. Proper conduct of this inspection requires a trained elevator mechanic as outlined in QEI-1 Standard for the Qualification of Elevator Inspectors, as augmented by local code or regulation.

Inspection Actions

1. Verify the extent of inspections required in the reference sections listed above.
2. Inspect components and subcomponents according to the reference provided.
3. Report all deficiencies to the facility manager.

Special Tools and Equipment

Special tools required beyond those listed in the Standard Tool Section are at the discretion of the inspector. A guide list is found in Division 7 of the introduction to ASME 17.2.

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level I inspection.

References

1. ASME 17.2
2. QEI-1, Standard for the Qualification of Elevator Inspectors

06.03 ESCALATOR

DESCRIPTION

Escalators are a subsystem of Building Conveying Systems. Escalators provide a means for conveying people between building elevations. They use motor-driven sprockets and chains to continuously drive a series of steps in a loop between floors. Primarily used for passenger service, these units are more easily installed in older buildings than elevators. They are also more "user friendly," avoiding the waiting time and queuing associated with elevators.

This system includes a supporting structure, the loop of steps, a handrail assembly, a drive assembly, and equipment panels and controls.

SPECIAL TOOL AND EQUIPMENT REQUIREMENTS

No special tools are needed for the inspection of escalators beyond those listed in the Standard Tools Section.

SPECIAL SAFETY REQUIREMENTS

The following special safety requirements, beyond those listed in the Master Safety Plan and System Safety Section, are necessary to perform the inspection of the Escalators.

1. Threshold plates at the upper and lower landings must be removed to permit inspection certain parts of the escalator. The building manager must provide personnel to remove the plates and provide barricades for this part of the inspection.

2. Safety barricade both ends of the escalator to prevent use during inspection.

3. Before entering the escalator machinery space, at either the upper or lower landing, disconnect the electric power from the escalator driving machine and brake by opening the safety stop switch, or mainline disconnect switch, provided within the space. Lock the disconnect switch in the open position with a padlock.

COMPONENT LIST

- ◆ 06.03.01 HANDRAIL ASSEMBLY
- ◆ 06.03.02 MOTOR AND DRIVE ASSEMBLY
- ◆ 06.03.03 STRUCTURE
- ◆ 06.03.04 CONTROLS

06.03 ESCALATOR

RELATED SUBSYSTEMS

Due to the related nature of the elements requiring inspection, the following systems and subsystems should be reviewed for concurrent inspection activities.

02.02	FLOOR FRAMING AND DECK
02.04	BALCONIES
05.05	INTERIOR FLOOR/FLOOR COVERING
05.06	INTERIOR CEILING
10.02	LOW VOLT DIST. SYSTEM 600V OR LESS

STANDARD INSPECTION PROCEDURE

Escalator inspection requires both Level I and Level II inspections as part of the basic inspection process. Additional Level II or Level III inspections may be indicated or "triggered" by Level I defect observations. Any additional Level II inspections should be accomplished by the inspector at that time. Associated defects and observations, for each major component of the escalator, are listed in the inspector's Data Collection Device.

COMPONENTS

◆ 06.03.01 HANDRAIL ASSEMBLY

The handrail assembly consists of the balustrades, which form the sides of the escalator, and the moving handrail, which rides on top of and passes through the balustrades. The balustrades serve as guide walls, prevent objects from falling off the escalator steps, and form the support structure for the moving handrail. Balustrade skirts form a tight intersection between the balustrade and the steps. Clearance must be no more than 3/16" on a side and a total of no more than 1/4" for both sides. Balustrades must be rigid and non-perforated. They may be made of metal, glass, or plastic. Glass balustrade panels may be transparent. Plastic panels must be bonded to a basic supporting panel. The handrail should move at the same speed as the steps to allow for a single passenger grip during transit. The handrail is generally made of rubber or a flexible synthetic material. The handrail is built into the balustrade with the grip portion riding on top of and the return portion going through or under the balustrade. The handrail entrance to and exit from the balustrade is equipped with finger/hand guards. It is typically driven like a v-belt using friction sheaves activated by the main drive assembly.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Operation:**			
Observation:			
a. Handrail speed substantially different from speed of steps.	EA	1	
***{Severity M}			
b. Handrail operation jerky or speed variable.	EA	1	
***{Severity M}			
c. Handrail not operating.	EA	2	
***{Severity H}			

06.03 ESCALATOR

COMPONENTS (Continued)

◆ 06.03.01 HANDRAIL ASSEMBLY (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Physical Wear and Damage:**			
Observation:			
a. Cracked, broken, or dented balustrade panels.	EA		
***{Severity L}			
b. Loose or missing nuts, bolts, and fasteners.	EA		
***{Severity L}			
c. Damaged or missing ceiling or soffit intersection guards.	EA		
***{Severity L}			
d. Loose, bent, or broken skirt panels.	EA		
***{Severity M}			
e. Projecting, burred, or damaged nuts, bolts, or fasteners.	EA		
***{Severity M}			
f. Handrail is damaged or worn but not interfering with operation.	EA		
***{Severity M}			
g. Handrail guards loose, dented, or bent.	EA		
***{Severity M}			
h. Finger/hand guards loose, bent, or broken	EA		
***{Severity M}			
i. Missing balustrade panels.	EA		
***{Severity H}			
j. Loose balustrade panels.	EA		
***{Severity H}			
k. Missing skirt panels.	EA		
***{Severity H}			
l. Handrail damaged or worn and interferes with operation.	EA		
***{Severity H}			
m. Handrail splice or joint is loose or rough.	EA		
***{Severity H}			
n. Handrail guards missing, broken or out of position.	EA		
***{Severity H}			
o. Finger/hand guards missing.	EA		
***{Severity H}			

06.03 ESCALATOR

COMPONENTS (Continued)

◆ 06.03.02 MOTOR AND DRIVE ASSEMBLY

The escalator Motor and Drive Assembly consists of an electric drive motor, gear reducer, brake assembly, sprockets and drive chain, step chain and rollers, steps, and track assembly. These components provide and transmit the motive force to the steps. The track assembly provides the path around which the steps travel. The track assembly also includes the step chain tension carriage, main drive shaft and the handrail drive.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Steps:**			
Observation:			
a. Step treads and riser ribs are bent, broken, or cracked.	EA	3	
***{Severity L}			
b. Step operation is jerky or speed variable.	EA	4	
***{Severity M}			
c. Step is wobbly during ride.	EA		1
***{Severity M}			
d. Step is loose, bent, cracked or broken.	EA	3	
***{Severity H}			
e. Step is worn is worn with loss of traction.	EA	3	
***{Severity H}			
f. Lubrication system is damaged or not working.	EA	3	
***{Severity H}			
g. Damaged, loose, or missing nuts, bolts, or fasteners.	EA	3	
***{Severity H}			

06.03 ESCALATOR

COMPONENTS (Continued)

◆ **06.03.02 MOTOR AND DRIVE ASSEMBLY (Continued)**

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
* **Motor Operation:** Note that all inspections are Level II in that they require access to machinery spaces.			
Observation:			
a. Surface corrosion (no pitting evident). ***{Severity L}	SF	4	
b. Motor housings contaminated. ***{Severity L}	EA	4	
c. Terminal box cover missing. ***{Severity L}	EA	4	
d. Excessively noisy. ***{Severity M}	EA	4	2
e. Corrosion evidenced by pitting or blistering. ***{Severity M}	SF	4	
f. Machine air passage dirty or clogged. ***{Severity M}	EA	4	
g. Motor frame cracked or broken. ***{Severity M}	EA	4	
h. Motor support cracked or broken. ***{Severity M}	EA	4	
i. Motor support shifted. ***{Severity M}	EA	4	
j. Defective mounting pads. ***{Severity M}	EA	4	
k. Excessive vibration. ***{Severity M}	EA	4	2
l. Excessive sparking at the collector rings, commutator, or brushes. ***{Severity M}	EA	4	3
m. Insulation of motor leads damaged or deteriorated. ***{Severity M}	EA	5	
n. Taping improperly installed or deteriorated. ***{Severity M}	EA	5	
o. Terminal connection inadequate. ***{Severity M}	EA	5	

06.03 ESCALATOR

COMPONENTS (Continued)

◆ 06.03.02 MOTOR AND DRIVE ASSEMBLY (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Motor (Continued):**			
Observation:			
p. Terminal or breaker body 5° to 24°C above ambient.	EA	6	4
***{Severity M}			
q. Corrosion evidenced by holes or loss of base metal.	EA	4	
***{Severity H}			
r. Loose or missing mounting bolts.	EA	4	
***{Severity H}			
s. Terminal or breaker body 25°C or more above ambient.	EA	6	4
***{Severity H}			
t. Unit not grounded.	EA	5	
***{Severity H}			

Defect:

*** Gear Reducer:** Note that all inspections are Level II in that they require access to machinery spaces.			
Observation:			
a. Gear reducer housing has surface rust, no pitting evident.	SF	3	
***{Severity L}			
b. Oil dipstick missing or damaged.	EA	3	
***{Severity L}			
c. Gear reducer corrosion with pitting and blistering of base metal.	SF	3	
***{Severity M}			
d. Gear reducer housing cracked, dented, or otherwise damaged.	EA	3	
***{Severity M}			
e. Oil leak at bearing or shaft seals.	EA	3	
***{Severity M}			
f. Gear Reducer corrosion with loss of base metal.	SF	3	
***{Severity H}			

06.03 ESCALATOR

COMPONENTS (Continued)

◆ 06.03.02 MOTOR AND DRIVE ASSEMBLY (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Gear Reducer (Continued):**			
Observation:			
g. Oil lubrication connection missing or damaged. ***{Severity H}	EA	3	
h. Oil leak at housing gasket. ***{Severity H}	EA	3	
i. Unit vibrates or makes loud or unusual noise during operation. ***{Severity H}	EA	3	5
j. Damaged, loose, or missing nuts, bolts or fasteners. ***{Severity H}	EA	3	

Defect:

*** Brake Assembly:**
Note that all inspections are Level II in that they require access to machinery spaces.

Observation:	UOM	LEVEL II KEY	LEVEL III KEY
a. Brake Assembly parts have surface rust, no pitting evident. ***{Severity L}	SF	3	
b. Parts have corrosion with pitting and blistering of base metal. ***{Severity M}	SF	3	
c. Parts have corrosion with loss of base metal. ***{Severity H}	SF	3	
d. Brake assembly parts are loose, cracked, or broken. ***{Severity H}	EA	3	
e. Damaged, loose, or missing nuts, bolts, or fasteners. ***{Severity H}	EA	3	

06.03 ESCALATOR

COMPONENTS (Continued)

◆ 06.03.02 MOTOR AND DRIVE ASSEMBLY (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
* **Sprocket and Drive Chain:** Note that all inspections are Level II in that they require access to machinery spaces.			
Observation:			
a. Sprocket loose or not square with shaft. ***{Severity M}	EA	3	
b. Sprocket teeth worn with distortion of tooth shape. ***{Severity M}	EA	3	
c. Drive chain parts worn with distortion of part shape. ***{Severity M}	EA	3	
d. Sprocket teeth or drive chain parts cracked or broken. ***{Severity H}	EA	3	
e. Oil lubrication system empty, damaged, or not working. ***{Severity H}	EA	3	

06.03 ESCALATOR

COMPONENTS (Continued)

◆ 06.03.03 STRUCTURE

The escalator structure consists of the truss, truss supports, threshold plates, and track assembly. The truss is a welded lattice type steel frame work that provides a rigid stable support for escalator mechanism. Truss supports consist of flexible vibration isolation cushions and sliding supports. Vibration isolation cushions are designed to prevent transmission of vibration and noise from the truss to the building structure. Sliding supports are designed to protect the truss from building movement in the event the escalator spans a building expansion joint. Threshold plates cover the service areas at the top and bottom of the escalator and form the transition between the floor surface and the escalator entrance or exit. The threshold plates; also called floor cover plates, are of metal construction and are designed with a rigid, skid proof surface to provide a safe foothold as the passenger approaches or leaves the escalator. They also provide access to the escalator mechanical space. The transition between the threshold plates and the escalator steps is provided by comb plates. Flat or slightly curved ribbed combs on the comb plate extend into the ribs on the steps to ensure a smooth transfer from the moving to the stationary part of the escalator.

Defect:	**UOM**	**LEVEL II KEY**	**LEVEL III KEY**
*** Physical Wear or Damage:**			
Observation:			
a. Threshold plates or comb plates are loose, cracked or broken.	EA		
***{Severity M}			
b. Comb plate teeth are bent, cracked, or missing.	EA		
***{Severity M}			
c. Threshold plates or comb plates are missing.	EA		
***{Severity H}			
d. Threshold or comb plate surface worn with loss of traction.	SF		
***{Severity H}			
e. Damaged, loose, or missing nuts, bolts, or fasteners.	EA		
*** (Severity H}			

06.03 ESCALATOR

COMPONENTS (Continued)

◆ 06.03.03 STRUCTURE (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Operation:**			
Observation:			
a. Underside of comb plate teeth above top of step ribs. ***{Severity H}	EA		
b. Comb plate is in contact with step ribs. ***{Severity H}	EA		

Defect:

*** Truss and Supports (at access plates):** Note that all inspections are Level in that they require access to machinery spaces.			
Observation:			
a. Truss supports or support components missing or damaged. ***{Severity M}	EA	7	
b. Truss member missing, bent, cracked or out of alignment. ***{Severity H}	EA	7	
c. Truss welds have cracks. ***{Severity H}	EA	7	

Defect:

*** Corrosion:** Note that all inspections are Level in that they require access to machinery spaces.			
Observation:			
a. Truss has surface rust, no pitting evident. ***{Severity L}	SF	7	
b. Truss corrosion with pitting and blistering of base material. ***{Severity M}	SF	7	
c. Truss corrosion with loss of base material. ***{Severity H}	EA	7	

06.03 ESCALATOR

COMPONENTS (Continued)

◆ 06.03.04 CONTROLS

Escalator controls provide for the automatic and safe operation of the unit. Emergency stop control stations are located on the balustrade at each end of the escalator. The emergency stop control station will have pilot lights and pushbuttons or switches for emergency control of the escalator. The pushbuttons or switches will be protected with covers or other devices against accidental operation. The control panel, housing the overall monitoring and control of the escalator unit, is usually located in the machine space at the upper or lower end of the escalator truss. (Some escalators may have control panels located at both ends of the truss.) The control panel consists of pilot lights, meters, audible alarms, etc. to monitor the escalator and pushbuttons, switches, relays, and a microprocessor to control the escalator. The control panel will have a socket for connecting a hand held pendent hand control for use during maintenance.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Corrosion - Control Station:**			
Observation:			
a. Surface corrosion (no pitting evident).	SF		
***{Severity L}			
b. Corrosion evidenced by pitting or blistering.	SF		
***{Severity M}			
c. Corrosion evidenced by holes or loss of base metal.	SF		
***{Severity H}			

Defect:

	UOM		
*** Physical Damage - Control Station:**			
Observation:			
a. Loose enclosure mounting.	EA		
***{Severity L}			
b. Indicating lamp inoperable.	EA		
***{Severity L}			
c. Indicating lens broken or missing.	EA		
***{Severity L}			
d. Enclosure damaged (cannot be sealed).	EA		
***{Severity M}			
e. Unused opening not covered.	EA		
***{Severity M}			
f. Pushbutton broken or missing.	EA		
***{Severity M}			
g. Selector switch broken or missing.	EA		
***{Severity M}			
h. Security devices missing or inoperable.	EA		
***{Severity H}			

06.03 ESCALATOR

COMPONENTS (Continued)

◆ 06.03.04 CONTROLS (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Corrosion - Control Panel:**			
Note that all inspections are Level II in that they require access to machinery spaces.			
Observation:			
a. Surface corrosion (no pitting evident). ***{Severity L}	SF	8	
b. Corrosion evidenced by pitting or blistering. ***{Severity M}	SF	8	
c. Corrosion evidenced by holes or loss of base metal. ***{Severity H}	SF	8	

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Physical Damage - Control Panel:**			
Note that all inspections are Level II in that they require access to machinery spaces.			
Observation:			
a. Loose enclosure mounting. ***{Severity L}	EA	8	
b. Panel fastener loose, broken or missing. ***{Severity L}	EA	8	
c. Indicating lamp inoperable. ***{Severity L}	EA	8	
d. Indicating lens broken or missing. ***{Severity L}	EA	8	
e. Enclosure damaged (cannot be sealed). ***{Severity M}	EA	8	
f. Unused opening not covered. ***{Severity M}	EA	8	
g. Pushbutton broken or missing. ***{Severity M}	EA	8	
h. Selector switch broken or missing. ***{Severity M}	EA	8	
i. Transformer discolored or blistered due to overheating. ***{Severity M}	EA	10	
j. Security devices missing or inoperable. ***{Severity H}	EA	8	
k. Door handle bent or inoperable. ***{Severity H}	EA	8	

06.03 ESCALATOR

COMPONENTS (Continued)

◆ **06.03.04 CONTROLS (Continued)**

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
* **Hot Spots - Control Panel:** Note that all inspections are Level II in that they require access to machinery spaces.			
Observation:			
a. Control transformer 5° to 24°C above ambient. ***{Severity M}	EA	9	6
b. Control transformer 25°C or more above ambient. ***{Severity H}	EA	9	6

06.03 ESCALATOR

REFERENCES

1. ANSI A17.1 Safety Code for Elevators, Dumbwaiters, Escalators, and Moving Walks

2. ANSI A17.2 Practices for the Inspection of Elevators, Escalators, and Moving Walks

3. Maintenance Technology/September 1993; Write-Up Title: Infrared Keeps All Systems Go

4. Raining - Agema Infrared Systems; Measurement of Excess Temperatures with Infrared Scanners

5. KATO Engineering, Instruction Manual for Brushless Revolving Field Alternating Current Generators

6. Owners Manual, Schindler Elevator Corporation

7. Operating Instructions, Dover Elevator Systems

8. SPEEDWALK - SPEEDRAMP Operation Instructions, Westmont Industries

9. "Handbook of Building and Plant Maintenance, Forms and Checklists" by Roger W. Liska and Judith Morrison Liska

10. Sverdrup Corporation

06.03 ESCALATOR

LEVEL II KEY	GUIDE SHEET CONTROL NUMBER
1	GS-II 06.03.01-1
2	GS-II 06.03.01-2
3	GS-II 06.03.02-3
4	GS-II 06.03.02-4
5	GS-II 06.03.02-5
6	GS-II 06.03.02-6
7	GS-II 06.03.03-7
8	GS-II 06.03.04-8
9	GS-II 06.03.04-9
10	GS-II 06.03.04-10

LEVEL III KEY	GUIDE SHEET CONTROL NUMBER
1	GS-III 06.03.02-1
2	GS-III 06.03.02-2
3	GS-III 06.03.02-3
4	GS-III 06.03.02-4
5	GS-III 06.03.02-5
6	GS-III 06.03.04-6

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 1

COMPONENT: HANDRAIL ASSEMBLY
CONTROL NUMBER: GS-II 06.03.01-1

Application

This guide applies to the investigation of escalator handrail that has a speed substantially different from the speed of the steps, that is jerky, or has a variable speed.

Special Safety Requirements

1. The facility manager must provide personnel to stop the escalator, remove the threshold plates, and to provide barricades for this part of the inspection.

2. Barricades must be provided at the ends of the escalator while the threshold plates are removed.

3. The facility manager must provide personnel to replace the threshold plates, remove the barricades, and start the escalator when the inspection is complete.

Inspection Items

1. Inspect handrail in drive and return areas for indication that the handrail is slipping.

2. Inspect handrail drive wheel friction lining for adequate thickness (at least 3mm).

3. Inspect tension rollers for proper adjustment.

4. Inspect handrail drive for indications of loose chain or sprockets.

5. Record the results.

Recommended Inspection Frequency

Do a Level II inspection each time a Level I inspection indicates one is required.

References

1. ANSI A17.1 Safety Code For Elevators, Dumbwaiters, Escalators, and Moving Walks

2. ANSI A17.2 Practices for the Inspection of Elevators, Escalators, and Moving Walks

3. Owners Manual, Schindler Elevator Corporation

4. Operating Instructions, Dover Elevator Systems

5. SPEEDWALK - SPEEDRAMP Operation Instructions, Westmont Industries

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 2

COMPONENT: HANDRAIL ASSEMBLY
CONTROL NUMBER: GS-II 06.03.01-2

Application

This guide applies to the investigation of an escalator handrail that is not operating.

Special Safety Requirements

1. The facility manager must provide personnel to stop the escalator, remove the threshold plates, and to provide barricades for this part of the inspection.

2. Barricades must be provided at the ends of the escalator while the threshold plates are removed.

3. The facility manager must provide personnel to replace the threshold plates, remove the barricades, and start the escalator when the inspection is complete.

Inspection Items

1. Inspect handrail in drive and return areas for indication that the handrail is broken or slipping.

2. Inspect handrail drive wheel friction lining for adequate thickness (at least 3mm).

3. Inspect tension rollers for proper adjustment.

4. Inspect handrail drive for broken chain or loose sprocket.

5. Record the results.

Recommended Inspection Frequency

Do a Level III inspection each time a Level I inspection indicates one is required.

References

1. ANSI A17.1 Safety Code For Elevators, Dumbwaiters, Escalators, and Moving Walks

2. ANSI A17.2 Practices for the Inspection of Elevators, Escalators, and Moving Walks

3. Owners Manual, Schindler Elevator Corporation

4. Operating Instructions, Dover Elevator Systems

5. SPEEDWALK - SPEEDRAMP Operation Instructions, Westmont Industries

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 3

COMPONENT: MOTOR AND DRIVE ASSEMBLY
CONTROL NUMBER: GS-II 06.03.02-3

Application

This guide applies to inspection of components located in the machine spaces under the escalator.

Special Safety Requirements

1. The facility manager must provide personnel to stop the escalator, remove the threshold plates, and to provide barricades for this part of the inspection.

2. Barricades must be provided at the ends of the escalator while the threshold plates are removed.

3. The facility manager must provide personnel to replace the threshold plates, remove the barricades, and start the escalator when the inspection is complete.

Inspection Items

Inspect all components and sub-components identified with the Level II Key No 3 .

Recommended Inspection Frequency

Do a Level II inspection each time a Level I inspection indicates one is required.

References

1. ANSI A17.1 Safety Code For Elevators, Dumbwaiters, Escalators, and Moving Walks

2. ANSI A17.2 Practices for the Inspection of Elevators, Escalators, and Moving Walks

3. Owners Manual, Schindler Elevator Corporation

4. Operating Instructions, Dover Elevator Systems

5. SPEEDWALK - SPEEDRAMP Operation Instructions, Westmont Industries

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 4

COMPONENT: MOTOR AND DRIVE ASSEMBLY
CONTROL NUMBER: GS-II 06.03.02-4

Application

This guide applies to the investigation of an escalator step with jerky or variable speed operation.

Special Safety Requirements

1. The facility manager must provide personnel to stop the escalator, remove the threshold plates, and to provide barricades for this part of the inspection.

2. Barricades must be provided at the ends of the escalator while the threshold plates are removed.

3. The facility manager must provide personnel to replace the threshold plates, remove the barricades, and start the escalator when the inspection is complete.

Inspection Items

1. Inspect step drive motor and gear reducer for indication of irregular output speed.

2. Inspect drive chain for proper tension.

3. Inspect step chain tension device for proper adjustment.

4. Record the results.

Recommended Inspection Frequency

Do a Level II inspection each time a Level I inspection indicates one is required.

References

1. ANSI A17.1 Safety Code For Elevators, Dumbwaiters, Escalators, and Moving Walks

2. ANSI A17.2 Practices for the Inspection of Elevators, Escalators, and Moving Walks

3. Owners Manual, Schindler Elevator Corporation

4. Operating Instructions, Dover Elevator Systems

5. SPEEDWALK - SPEEDRAMP Operation Instructions, Westmont Industries

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 5

COMPONENT: MOTOR AND DRIVE ASSEMBLY
CONTROL NUMBER: GS-II 06.03.02-5

Application

This guide applies to the investigation of the inside of an enclosure, containing bare, energized, electrical parts. The enclosure is located in the machine space under the escalator.

Special Safety Requirements

The following list of special safety requirements, beyond the requirements listed in the Master Safety Plan and System Safety Section, are to be observed in the performance of this inspection.

1. The facility manager must provide personnel to stop the escalator, remove the threshold plates, and to provide barricades for this part of the inspection.

2. Barricades must be provided at the ends of the escalator while the threshold plates are removed.

3. This inspection guide applies to enclosures containing live electrical parts having a potential of 600 volts or less above ground. If the enclosure contains circuitry of higher potential, do not use this inspection guide.

4. Any enclosure that is padlocked for safety reason is not to be opened unless okayed by the person having control of the key.

5. Inspector needs to carefully open, inspect the inside and close the enclosure without shutting down the equipment, and without creating a hazard to himself.

6. The facility manager must provide personnel to replace the threshold plates, remove the barricades, and start the escalator when the inspection is complete.

Inspection Actions

1. Open panels or doors carefully as required for doing the visual inspection.

2. Visually inspect for those physical damaged defects that are listed and tagged Level Key No. as indicated above.

3. Close panels or doors carefully after the inspection is completed.

Recommended Inspection Frequency

Do a Level II inspection each time a Level I inspection indicates one is required.

References

1. Sverdrup Corporation

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 6

COMPONENT: MOTOR AND DRIVE ASSEMBLY
CONTROL NUMBER: GS-II 06.03.02-6

Application

This guide applies to the investigation of the inside of an enclosure, containing bare, energized, electrical parts. The enclosure is located in the machine space under the escalator.

Special Safety Requirements

The following list of special safety requirements, beyond the requirements listed in the Master Safety Plan and System Safety Section, are to be observed in the performance of this inspection.

1. The facility manager must provide personnel to stop the escalator, remove the threshold plates, and to provide barricades for this part of the inspection.
2. Barricades must be provided at the ends of the escalator while the threshold plates are removed.
3. This inspection guide applies to enclosures containing live electrical parts having a potential of 600 volts or less above ground. If the enclosure contains circuitry of higher potential, do not use this inspection guide.
4. Any enclosure that is padlocked for safety reason is not to be opened unless okayed by the person having control of the key.
5. Inspector needs to open, inspect the inside and close the enclosure without shutting down the equipment.
6. The facility manager must provide personnel to replace the threshold plates, remove the barricades, and start the escalator when the inspection is complete.

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 6 (Continued)

COMPONENT: MOTOR AND DRIVE ASSEMBLY
CONTROL NUMBER: GS-II 06.03.02-6

Inspection Actions

1. Open panels or doors as required for scanning those devices being tested.
2. Make temperature measurements with an infrared scanner.
3. Measure the ambient temperature by measuring a spot on the inside of the enclosure that is least effected by any internal panel heat source.
4. Measure the temperature of the device specified.
5. Above ambient temperature is calculated by subtracting the ambient temperature from the device temperature.
6. Record the results.
7. Close panels or doors after the inspection is complete.

Recommended Inspection Frequency

Do a Level II inspection each time a Level I inspection is made.

References

1. Maintenance Technology/September 1993; Write-up Title: "Infrared Keeps All Systems Go"
2. Raining - Agema Infrared Systems; "Measurement of Excess Temperatures with Infrared Scanners"

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 7

COMPONENT: STRUCTURE
CONTROL NUMBER: GS-II 06.03.03-7

Application

This guide applies to inspection of components located in the machine spaces under the escalator.

Special Safety Requirements

1. The facility manager must provide personnel to stop the escalator, remove the threshold plates, and to provide barricades for this part of the inspection.

2. Barricades must be provided at the ends of the escalator while the threshold plates are removed.

3. The facility manager must provide personnel to replace the threshold plates, remove the barricades, and start the escalator when the inspection is complete.

Inspection Items

Inspect all components and sub-components identified with the Level II Key No 7.

Recommended Inspection Frequency

Do a Level II inspection each time a Level I inspection indicates one is required.

References

1. Sverdrup Corporation

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 8

COMPONENT: CONTROLS
CONTROL NUMBER: GS-II 06.03.04-8

Application

This guide applies to inspection of components located in the machine spaces under the escalator.

Special Safety Requirements

1. The facility manager must provide personnel to stop the escalator, remove the threshold plates, and to provide barricades for this part of the inspection.
2. Barricades must be provided at the ends of the escalator while the threshold plates are removed.
3. The facility manager must provide personnel to replace the threshold plates, remove the barricades, and start the escalator when the inspection is complete.

Inspection Item

Inspect all components and sub-components identified with the Level II Key No 8.

Recommended Inspection Frequency

Do a Level II inspection each time a Level I inspection indicates one is required.

References

1. Sverdrup Corporation

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 9

COMPONENT: CONTROLS
CONTROL NUMBER: GS-II 06.03.04-9

Application

This guide applies to the investigation of the inside of an enclosure, containing bare, energized, electrical parts. The enclosed is located in the machine space under the escalator.

Special Safety Requirements

The following list of special safety requirements, beyond the requirements listed in the Master Safety Plan and System Safety Section, are to be observed in the performance of this inspection.

1. The facility manager must provide personnel to stop the escalator, remove the threshold plates, and to provide barricades for this part of the inspection.

2. Barricades must be provided at the ends of the escalator while the threshold plates are removed.

3. This inspection guide applies to enclosures containing live electrical parts having a potential of 600 volts or less above ground. If the enclosure contains circuitry of higher potential, do not use this inspection guide.

4. Any enclosure that is padlocked for safety reason is not to be opened unless okayed by the person having control of the key.

5. Inspector needs to carefully open, inspect the inside and close the enclosure without shutting down the equipment, and without creating a hazard to himself.

6. The facility manager must provide personnel to replace the threshold plates, remove the barricades, and start the escalator when the inspection is complete.

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 9 (Continued)

COMPONENT: CONTROLS
CONTROL NUMBER: GS-II 06.03.04-9

Inspection Actions

1. Open panels or doors carefully as required for scanning those devices being tested.
2. Make temperature measurements with an infrared scanner.
3. Measure the ambient temperature by measuring a spot on the inside of the enclosure that is least effected by any internal panel heat source.
4. Measure the temperature of the device specified.
5. Above ambient temperature is calculated by subtracting the ambient temperature from the device temperature.
6. Record the results.
7. Close panels or doors carefully after the inspection is complete.

Recommended Inspection Frequency

Do a Level II inspection each time a Level I inspection is made.

References

1. Maintenance Technology/September 1993; Write-up Title: "Infrared Keeps All Systems Go"
2. Raining - Agema Infrared Systems; "Measurement of Excess Temperatures with Infrared Scanners"

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 10

COMPONENT: CONTROLS
CONTROL NUMBER: GS-II 06.03.04-10

Application

This guide applies to the investigation of the inside of an enclosure, containing bare, energized, electrical parts. The enclosure is located in the machine space under the escalator.

Special Safety Requirements

The following list of special safety requirements, beyond the requirements listed in the Master Safety Plan and System Safety Section, are to be observed in the performance of this inspection.

1. The facility manager must provide personnel to stop the escalator, remove the threshold plates, and to provide barricades for this part of the inspection.
2. Barricades must be provided at the ends of the escalator while the threshold plates are removed.
3. This inspection guide applies to enclosures containing live electrical parts having a potential of 600 volts or less above ground. If the enclosure contains circuitry of higher potential, do not use this inspection guide.
4. Any enclosure that is padlocked for safety reason is not to be opened unless okayed by the person having control of the key.
5. Inspector needs to carefully open, inspect the inside and close the enclosure without shutting down the equipment, and without creating a hazard to himself.
6. The facility manager must provide personnel to replace the threshold plates, remove the barricades, and start the escalator when the inspection is complete.

Inspection Actions

1. Open panels or doors carefully as required for doing the visual inspection.
2. Visually inspect for those physical damaged defects that are listed and tagged Level II Key No. as indicated above.
3. Close panels or doors carefully after the inspection is completed.

Recommended Inspection Frequency

Do a Level II inspection each time a Level I inspection indicates one is required.

References

1. Sverdrup Corporation

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 1

COMPONENT: MOTOR AND DRIVE ASSEMBLY
CONTROL NUMBER: GS-III 06.03.02-1

Application

This guide applies to the investigation of an escalator step that is wobbly during the ride.

Special Safety Requirements

1. The facility manager must provide personnel to stop the escalator, remove the threshold plates, comb plates, and steps as necessary and to provide barricades for this part of the inspection.

2. Barricades must be provided at each end of the escalator while the plates and steps are removed.

3. The facility manager must provide personnel to replace the plates and steps, remove the barricades, and start the escalator when the inspection is complete.

Inspection Actions

1. Inspect steps for cracks or breaks.

2. Inspect roller mounting brackets for breaks or loose connection to steps.

3. Inspect step rollers and chain rollers for damage.

4. Inspect roller tracks and track supports for loose connections, damage, or out of alignment.

Special Tools and Equipment

The following is a list of special tools required beyond those listed in the Standard Tool Section.

1. Screwdrivers

2. Socket wrenches

3. Feeler gauges

4. Special tools as recommended by the escalator manufacturer.

Recommended Inspection Frequency

Do a Level II inspection when triggered by a Level I inspection.

References

1. Sverdrup Corporation

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 2

COMPONENT: MOTOR AND DRIVE ASSEMBLY
CONTROL NUMBER: GS-III 06.03.02-2

Application

This guide applies to the investigation of electrical motors having excessive noise or vibration symptoms. The motor is located in the enclosed space under the escalator.

Special Safety Requirements

1. The facility manager must provide personnel to stop the escalator, remove the threshold plates, and to provide barricades for this part of the inspection.
2. Barricades must be provided at the ends of the escalator while the threshold plates are removed.
3. The facility manager must provide personnel replace the threshold plates, remove the barricades, and start the escalator when the inspection is complete.

Inspection Actions

1. Verify the findings of Level II inspection by using the vibration/sound level meter and measure the velocity (inches/second, peak), displacement (mils, peak-peak) and noise (db). Compare reading with acceptable manufacturer tolerances.
2. Inspect bearings for defects or dryness.
3. Inspect electrical motor and load unit for misalignment.
4. Inspect electrical motor and load unit for proper mounting.
5. Inspect electrical motor and load unit for transfer of vibration from another source.
6. Inspect coupling for loose connection.
7. If none of the above is the problem, reference manufacturer troubleshooting guide for additional inspections or repairs to be made.

Special Tools and Equipment

The following is a list of special tools required beyond those listed in the Standard Tool Section.

1. Vibration/sound level meter, IDR Mechanalysis #1TC87

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 2 (Continued)

COMPONENT: MOTOR AND DRIVE ASSEMBLY
CONTROL NUMBER: GS-III 06.03.02-2

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level II inspection.

References

1. KATO Engineering, Instruction Manual for Brushless Revolving Field Alternating Current Generators

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 3

COMPONENT: MOTOR AND DRIVE ASSEMBLY
CONTROL NUMBER: GS-III 06.03.02-3

Application

This guide applies to the investigation of excessive sparking at the collector rings, commutator or brushes. The motor is located in the machine space under the escalator.

Special Safety Requirements

1. The facility manager must provide personnel to stop the escalator, remove the threshold plates, and to provide barricades for this part of the inspection.

2. Barricades must be provided at the ends of the escalator while the threshold plates are removed.

3. The facility manager must provide personnel to replace the threshold plates, remove the barricades, and start the escalator when the inspection is complete.

Inspection Actions

Level II Inspector will detect excessive sparking in the area of either the collector rings, commutator or brushes. Level III Inspector will perform the following tasks.

1. Verify that there is excessive sparking in the area of either the collector rings, commutator or brushes.

2. If there is a problem, stop the motor and evaluate the problems causing the sparking.

3. Classify the severity of the problem and recommend the procedure needed to correct the problem.

4. If the Level III Inspector can not evaluate the problem, recommend the next procedure required to further identify the correction procedure that needs to be followed.

Special Tools and Equipment

The following is a list of special tools required beyond those listed in the Standard Tool Section.

1. Wrenches

2. Feelers

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 3 (Continued)

COMPONENT: MOTOR AND DRIVE ASSEMBLY
CONTROL NUMBER: GS-III 06.03.02-3

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level II inspection.

References

1. "Handbook of Building and Plant Maintenance, Forms and Checklists" by Roger W. Liska and Judith Morrison Liska

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 4

COMPONENT: MOTOR AND DRIVE ASSEMBLY
CONTROL NUMBER: GS-III 06.03.02-4

Application

This guide applies to the investigation of a hot terminal or device that is overheating from the flow of current through that terminal or device. The motor is located in the machine space under the escalator.

Special Safety Requirements

1. The facility manager must provide personnel to stop the escalator, remove threshold plates, and to provide barricades for this part of the inspection.

2. Barricades must be provided at the ends of the escalator while the threshold plates are removed.

3. The facility manager must provide personnel to replace the threshold plates, remove the barricades, and start the escalator when the inspection is complete.

Inspection Actions

1. Verify the findings of Level II inspection by using the Infrared Scanner and measuring the temperatures of the device and terminals. If the device or terminals are not hot as indicated by the findings of Level II inspection, check the current flow through the device or terminals. Heat generated is proportionate to the square of the current. If there is little or no current flow through the device or terminal at the time of measurement, there will be no significant amount of heat generated.

2. For terminal connections, verify the type of conductor being terminated. If the conductor is an aluminum conductor, look for evidence of cold flow or melt down of conductor.

3. If there is evidence of cold flow or melt down of the aluminum conductor, the conductor should either be replaced or shortened and reconnected. When making new aluminum conductor terminations a joint compound should be used.

4. If the terminal is loose it should be tightened.

5. If none of the above is the problem than there is an internal problem and an on-site analysis must be made to determine if additional inspections are to be made or the unit is to be replaced.

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 4 (Continued)

COMPONENT: MOTOR AND DRIVE ASSEMBLY
CONTROL NUMBER: GS-III 06.03.02-4

Special Tools and Equipment

The following is a list of special tools required beyond those listed in the Standard Tool Section.

1. Infrared Scanner, Raytek, Inc., #PM2EM-L2
2. Torque wrench
3. Digital Multimeter, Fluke #ITC676

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level II inspection.

References

1. Maintenance Technology/September 1993; Write-Up Title: "Infrared Keeps All Systems Go"
2. Raining - Agema Infrared Systems; "Measurement of Excess Temperatures with Infrared Scanners"

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 5

COMPONENT: MOTOR AND DRIVE ASSEMBLY
CONTROL NUMBER: GS-III 06.03.02-5

Application

This guide applies to investigation of a gear reducer that vibrates or makes a loud or unusual noise during operation. The gear reducer is located in the machine space at the end of the escalator.

Special Safety Requirements

The following is a list of special safety requirements beyond those listed in the Master Safety Plan and System Safety Section:

1. The facility manager must provide personnel to stop the escalator, remove the threshold plates, comb plates, and steps as necessary and to provide barricades for this part of the inspection.

2. Barricades must be provided at each end of the escalator while the plates and steps are removed.

3. The facility manager must provide personnel to replace the plates and steps, remove the barricades, and start the escalator when the inspection is complete.

Inspection Actions

1. Verify the findings of the Level II inspection by using the vibration/sound level meter and measure the velocity (inches/second, peak), displacement (mils, peak-peak), and noise (dB). Compare reading with acceptable manufacturer tolerances.

2. Inspect motor, gear reducer, and load unit for transfer of vibration from another source.

3. Lock out the main power supply to the gear reducer.

4. Remove v-belt, drive chain, or otherwise disconnect the gear reducer output shaft from the load.

5. Check if any rotating parts are rubbing against stationary parts by hand rotation of the gear reducer input shaft and noting any excessive physical effort necessary to hand rotate the reducer, scraping noises, or varied resistance to rotation.

6. Disassemble the gear reducer and inspect for foreign matter within the casing.

7. Check for wear and damage to casing, gears, and worm.

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 5 (Continued)

COMPONENT: MOTOR AND DRIVE ASSEMBLY
CONTROL NUMBER: GS-III 06.03.02-5

Inspection Actions (Continued)

8. Worn bearings and coupling misalignment can cause the shaft to run off center. Check bearings for wear and, using the straight edge and feeler gauges or a dial indicator, check alignment of coupling halves.
9. Check shaft to determine if it is bent.
10. Inspect coupling for loose connection.
11. Check rotating elements to see if they are out of balance.
12. Check for excess grease or oil in bearing housing.
13. Check for lack of lubrication.
14. Check for improper installation of bearings.
15. Check for dirt or rust on bearings.
16. Check rigidity of motor and gear reducer mounting and base.
17. Inspect gear reducer in accordance with the manufacturer's Operation and Maintenance Manual.
18. Record the results.

Special Tools and Equipment

The following is a list of special tools and equipment, beyond the requirements listed in the Standard Tool Section.

1. Wrenches
2. Screwdrivers
3. Straightedge
4. Dial indicator
5. Vibration/sound level meter, IDR Mechanalysis #1TC87
6. Tapered thickness gauge or feeler gauges
7. Special tools as recommended by the equipment manufacturer.

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 5 (Continued)

COMPONENT: MOTOR AND DRIVE ASSEMBLY
CONTROL NUMBER: GS-III 06.03.02-5

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level II inspection.

References

1. KATO Engineering, Instruction Manual for Brushless Revolving Field Alternating Current Generators

2. Sverdrup Corporation

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 6

COMPONENT: CONTROLS
CONTROL NUMBER: GS-III 06.03.04-6

Application

This guide applies to the investigation of a hot terminal or device that is overheating from the flow of current through that terminal or device. The control panel is located in the machine space under the escalator.

Special Safety Requirements

1. The facility manager must provide personnel to stop the escalator, remove the threshold plates, and to provide barricades for this part of the inspection.

2. Barricades must be provided at the ends of the escalator while the threshold plates are removed.

3. The facility manager must provide personnel to replace the threshold plates, remove the barricades, and start the escalator when the inspection is complete.

Inspection Actions

1. Verify the findings of Level II inspection by using the Infrared Scanner and measuring the temperatures of the device and terminals. If the device or terminals are not hot as indicated by the findings of Level II inspection, check the current flow through the device or terminals. Heat generated is proportionate to the square of the current. If there is little or no current flow through the device or terminal at the time of measurement, there will be no significant amount of heat generated.

2. For terminal connections, verify the type of conductor being terminated. If the conductor is an aluminum conductor, look for evidence of cold flow or melt down of conductor.

3. If there is evidence of cold flow or melt down of the aluminum conductor, the conductor should either be replaced or shortened and reconnected. When making new aluminum conductor terminations a joint compound should be used.

4. If the terminal is loose it should be tightened.

5. If none of the above is the problem than there is an internal problem and an on-site analysis must be made to determine if additional inspections are to be made or the unit is to be replaced.

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 6 (Continued)

COMPONENT: CONTROLS
CONTROL NUMBER: GS-III 06.03.04-6

Special Tools and Equipment

The following is a list of special tools required beyond those listed in the Standard Tool Section.

1. Infrared Scanner, Raytek, Inc., #PM2EM-L2

2. Torque wrench

3. Digital Multimeter, Fluke #1TC676

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level II inspection.

References

1. Maintenance Technology/September 1993; Write-Up Title: "Infrared Keeps All Systems Go"

2. Raining - Agema Infrared Systems; "Measurement of Excess Temperatures with Infrared Scanners"

06.04 PNEUMATIC TUBE ASSEMBLY

DESCRIPTION

A pneumatic tube assembly provides a means for the conveyance of small objects between buildings and building elevations. They employ a blower to alternately create a pressure or vacuum in a tubing network, thus creating a differential pressure across objects in the tube. By controlling the pressure difference and the position of diverters, objects can be routed to any position in the system. A pneumatic tube system may be consist of one blower serving one or more receiving/sending stations or a multiple zone system interconnected with transfer units. Each zone will be served by a dedicated blower.

The system includes blowers, motors, diverter valves, station controls, main control center, connecting tubing, fittings, and supports.

SPECIAL TOOL AND EQUIPMENT REQUIREMENTS

No special tools are needed for the inspection of a pneumatic conveying assembly beyond those listed in the Standard Equipment Requirements section of the introduction.

SPECIAL SAFETY REQUIREMENTS

No special safety requirements are needed for the inspection of the pneumatic tube assembly, beyond the requirements listed in the Master Safety Plan and System Safety Section.

COMPONENT LIST

- 06.04.01 BLOWERS
- 06.04.02 MOTORS
- 06.04.03 TUBING AND TUBE FITTINGS
- 06.04.04 VALVES
- 06.04.05 CONTROL CENTER
- 06.04.06 STATIONS
- 06.04.07 TRANSFER UNITS (DIVERTERS)
- 06.04.08 CARRIERS

RELATED SUBSYSTEMS

Due to the related nature of the elements requiring inspection, the following systems and subsystems should be reviewed for concurrent inspection activities.

02.01	STRUCTURAL FRAME
02.02	FLOOR FRAMING AND DECK
10.00	BUILDING ELECTRICAL
10.02	LOW VOLTAGE DIST. SYSTEM 600V OR LESS
29.00	ELECTRICAL DISTRIBUTION

06.04 PNEUMATIC TUBE ASSEMBLY

STANDARD INSPECTION PROCEDURE

Pneumatic Tube Assembly inspection requires both Level I and Level inspections as part of the basic inspection process. Additional Level or Level I inspections may be indicated or "triggered" by Level I defect observations. Any additional Level inspections should be accomplished by the inspector at the time of the Level I inspection. Associated defects and observations, for each major component of the pneumatic tube assembly, are listed in the inspector's Data Collection Device.

The Pneumatic Tube Assembly will be inspected, if possible, while it is in use. Certain items are noted as requiring an operational observation or information from the operator.

COMPONENTS

◆ 06.04.01 BLOWER

Blowers provide pressurized air and vacuum for operation of the pneumatic tube assembly.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Excessive Noise or Vibration at Blower:**			
Observation:			
a. Rattling noise.	EA	1	1
***{Severity M}			
b. Grinding noise, indicating metal to metal contact.	EA	1	1
***{Severity H}			

Defect:

*** Defective Blower:**			
Observation:			
a. Cracked or damaged housing.	EA		
***{Severity M}			
b. Cracked or damaged blades.	EA		
***{Severity H}			

Defect:

*** Defective Mounting Blower Hardware or Supports:**			
Observation:			
a. Loose hardware or supports.	EA		
***{Severity M}			
b. Missing or damaged hardware or supports.	EA		
***{Severity H}			

06.04 PNEUMATIC TUBE ASSEMBLY

COMPONENTS (Continued)

◆ **06.04.01 BLOWER (Continued)**

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
* **Defective Motorbase Mounting Hardware:**			
Observation:			
a. Loose base tie-down bolts.	EA		
***{Severity M}			
b. Missing or damaged base tie-down bolts or isolators.	EA		
***{Severity H}			

Defect:

	UOM	LEVEL II KEY	LEVEL III KEY
* **Defective Fan Belts.**			
Observation:			
a. Loose fan belt.	EA		
***{Severity F}			
b. Missing or broken fan belt.	EA		
***{Severity F}			

06.04 PNEUMATIC TUBE ASSEMBLY

COMPONENTS (Continued)

◆ 06.04.02 MOTOR

The blower for the pneumatic tube assembly is driven by an electric motor. Transfer units may also be equipped with electric motors.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
* **Corrosion:**			
Observation:			
a. Surface corrosion (no pitting evident).	SF		
***{Severity L}			
b. Corrosion evidenced by pitting or blistering.	SF		
***{Severity M}			
c. Corrosion evidenced by holes or loss of base metal.	SF		
***{Severity H}			

Defect:

* **Housekeeping:**			
Observation:			
a. Motor housings contaminated.	EA		
***{Severity L}			
b. Machine air passage dirty or clogged.	EA		
***{Severity M}			

Defect:

* **Structure:**			
Observation:			
a. Motor frame cracked or broken.	EA		
***{Severity M}			
b. Motor support cracked or broken.	EA		
***{Severity M}			
c. Motor support shifted.	EA		
***{Severity M}			
d. Defective mounting pads.	EA		
***{Severity M}			
e. Loose or missing mounting bolts.	EA		
***{Severity H}			

06.04 PNEUMATIC TUBE ASSEMBLY

COMPONENTS (Continued)

◆ 06.04.02 MOTOR (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Motor Operation:**			
Observation:			
a. Excessively noisy.	EA		2
***{Severity M }			
b. Excessive vibration.	EA		2
***{Severity M}			
c. Excessive sparking at the collector rings, commutator, or brushes.	EA		3
***{Severity M}			

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Power Connections:**			
Observation:			
a. Terminal box cover missing.	EA		
***{Severity L}			
b. Insulation of motor leads damaged or deteriorated.	EA	2	
***{Severity M}			
c. Taping improperly installed or deteriorated.	EA	2	
***{Severity M}			
d. Unit not grounded.	EA	3	
***{Severity H}			

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Hot Spots:**			
Observation:			
a. Terminal 5° to 24°C above ambient.	EA	3	4
***{Severity M}			
b. Terminal 25°C or more above ambient.	EA	3	4
***{Severity H}			

06.04 PNEUMATIC TUBE ASSEMBLY

COMPONENTS (Continued)

◆ 06.04.03 TUBING AND TUBE FITTINGS

Tubing and tube fittings for pneumatic tube assemblies may be standard galvanized steel OD tubing and fittings or may be other materials with components specially designed for this type system. Thin wall galvanized carbon steel, Schedule 10 or less, is the most common material.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Leakage:**			
Observation:			
a. Leakage at joints.	EA		
***(Severity M)			
b. Leakage at drive sleeve joints.	EA		
***(Severity M)			
c. Leakage through tube or fitting wall.	EA		
***(Severity H)			

Defect:

*** Corrosion:**			
Observation:			
a. Surface corrosion (no pitting evident).	LF		
***(Severity L)			
b. Corrosion evidenced by pitting or blistering.	LF		
***(Severity M)			
c. Corrosion evidenced by holes or loss of base metal.	LF		
***(Severity H)			

Defect:

*** Support Connections:**			
Observation:			
a. Loose bolts or fasteners.	EA		
***(Severity M)			
b. Broken or missing nuts, bolts, or fasteners.	EA		
***(Severity H)			
c. Cracked or broken weld.	EA		
***(Severity H)			

06.04 PNEUMATIC TUBE ASSEMBLY

COMPONENTS (Continued)

◆ 06.04.03 TUBING AND TUBE FITTINGS (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Physical Damage or Movement:**			
Observation:			
a. Tubing dented, cracked, or damaged. ***(Severity H)	LF		
b. Tube fittings dented, cracked, or damaged. ***(Severity H)	LF		
c. Evidence of excessive tube movement. ***(Severity H)	LF		
d. Tubing is offset from normal position on support. ***(Severity H)	LF		

Defect:

*** Paint:**

Observation:	UOM
a. Paint is worn; metal not showing. ***(Severity L)	SF
b. Paint is worn; metal is showing. ***(Severity M)	SF
c. Paint is scratched, chipped, flaking, chalked, or blistered. ***(Severity M)	SF

06.04 PNEUMATIC TUBE ASSEMBLY

COMPONENTS (Continued)

◆ 06.04.04 VALVES

Valves control the pressurized air or vacuum that moves objects through the pneumatic tube assembly. Pressure relief valves, located at each station, relieve pressure from the tube when an object is coming in to the station. Vacuum bypass valves, located adjacent to transfer units in the tube serving the common end of the transfer unit, prevent an object from being vacuumed back into the unit. Shift valves, located at the blower, provide pressure or vacuum to the system as needed. Valves in the pneumatic tube assembly are usually unique to this type of service.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Corrosion:**			
Observation:			
a. Surface corrosion (no pitting evident). ***(Severity L)	SF		
b. Corrosion evidenced by pitting or blistering. ***(Severity M)	SF		
c. Corrosion evidenced by holes or loss of base metal. ***(Severity H)	SF		

Defect:

	UOM
*** Support Connections:**	
Observation:	
a. Loose bolts or fasteners. ***(Severity M)	EA
b. Broken or missing nuts, bolts, or fasteners. ***(Severity H)	EA
c. Cracked or broken weld. ***(Severity H)	EA

06.04 PNEUMATIC TUBE ASSEMBLY

COMPONENTS (Continued)

◆ 06.04.04 VALVES (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
* **Physical Damage or Movement:**			
Observation:			
a. Valve is dented, cracked, or damaged. ***(Severity H)	EA		
b. Valve is misaligned with tubing. ***(Severity H)	EA		
c. Pressure relief valve flapper or hinge pin is missing. ***(Severity H)	EA		
d. Vacuum bypass valve operator is missing. ***(Severity H)	EA		
e. Shift valve operator is missing. ***(Severity H)	EA		

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
* **Operation:**			
Observation:			
a. Pressure relief valve leaks. ***(Severity M)	EA		
b. Vacuum bypass valve leaks. ***(Severity M)	EA		
c. Vacuum bypass valve operates slowly. ***(Severity M)	EA		5
d. Shift valve leaks. ***(Severity M)	EA		
e. Shift valve operates slowly. ***(Severity M)	EA		6
f. Pressure relief valve flapper does not operate freely. ***(Severity H)	EA	4	
g. Vacuum bypass valve does not operate. ***(Severity H)	EA		5
h. Shift valve does not operate. ***(Severity H)	EA		6

06.04 PNEUMATIC TUBE ASSEMBLY

COMPONENTS (Continued)

◆ 06.04.04 VALVES (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Paint:**			
Observation:			
a. Paint is worn; metal not showing.	SF		
***(Severity L)			
b. Paint is worn; metal is showing.	SF		
***(Severity M)			
c. Paint is scratched, chipped, flaking, chalked, or blistered.	SF		
***(Severity M)			

06.04 PNEUMATIC TUBE ASSEMBLY

COMPONENTS (Continued)

◆ 06.04.05 CONTROL CENTER

The control center, housing the overall monitoring and control of the pneumatic tube assembly may be located near the unit or in a central control area. The control center consists of pilot lights, meters, audible alarms, computer readout terminal, etc. to monitor the pneumatic tube assembly and pushbuttons, switches, relays, microprocessor, etc. to control the pneumatic tube assembly.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
* **Corrosion:**			
Observation:			
a. Surface corrosion (no pitting evident). ***{Severity L}	SF		
b. Corrosion evidenced by pitting or blistering. ***{Severity M}	SF		
c. Corrosion evidenced by holes or loss of base metal. ***{Severity H}	SF		

Defect:

* **Physical Damage:**			
Observation:			
a. Loose enclosure mounting. ***{Severity L}	EA		
b. Panel fastener loose, broken or missing. ***{Severity L}	EA		
c. Indicating lamp inoperable. ***{Severity L}	EA		
d. Indicating lens broken or missing. ***{Severity L}	EA		
e. Enclosure damaged (cannot be sealed). ***{Severity M}	EA		
f. Unused opening not covered. ***{Severity M}	EA		
g. Pushbutton broken or missing. ***{Severity M}	EA		
h. Selector switch broken or missing. ***{Severity M}	EA		
i. Printer is dented, broken, or damaged. ***(Severity M)	EA		

06.04 PNEUMATIC TUBE ASSEMBLY

COMPONENTS (Continued)

◆ 06.04.05 CONTROL CENTER (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Physical Damage (Continued):**			
Observation:			
j. Transformer discolored or blistered due to overheating.	EA	6	
***{Severity M}			
k. Door handle bent or inoperable.	EA		
***{Severity H}			
l. Security devices missing or inoperable.	EA		
***{Severity H}			
m. Keyboard or keypad is broken or damaged.	EA		
***(Severity H)			
n. Computer enclosure is dented, broken, or damaged.	EA		
***(Severity H)			
o. Computer readout terminal is dented, broken, or damaged.	EA		
***(Severity H)			
Defect:			
*** Hot Spots:**			
Observation:			
a. Control transformer 5° to 24°C above ambient.	EA	5	7
***{Severity M}			
b. Control transformer 25°C or more above ambient.	EA	5	7
***{Severity H}			
Defect:			
*** Operation:** Based on observation of operation or on information from using or operating personnel.			
Observation:			
a. Keyboard does not work.	EA		8
***{Severity H}			
b. Computer does not work.	EA		8
***{Severity H}			
c. Readout terminal does not work.	EA		8
***{Severity H}			
d. Printer does not work.	EA		8
***{Severity H}			

06.04 PNEUMATIC TUBE ASSEMBLY

COMPONENTS (Continued)

◆ 06.04.06 STATIONS

Stations are terminal points where objects or carriers are received or sent. Receiving/sending stations may be recessed wall units or console units designed to sit on or under a desk or counter. Each station will have controls for selecting the destination of carriers sent from the station. Some stations will be equipped with two or more receiving or sending tubes. Most stations will have provisions for carrier storage.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Corrosion:**			
Observation:			
a. Surface corrosion (no pitting evident).	SF		
***{Severity L}			
b. Corrosion evidenced by pitting or blistering.	SF		
***{Severity M}			
c. Corrosion evidenced by holes or loss of base metal.	SF		
***{Severity H}			

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Physical Damage:**			
Observation:			
a. Loose enclosure mounting.	EA		
***{Severity L}			
b. Indicating lamp inoperable.	EA		
***{Severity L}			
c. Indicating lens broken or missing.	EA		
***{Severity L}			
d. Carrier storage is bent, broken, or damaged.	EA		
e. Enclosure damaged (cannot be sealed).	EA		
***{Severity M}			
f. Unused opening not covered.	EA		
***{Severity M}			
g. Pushbutton broken or missing.	EA		
***{Severity M}			
h. Selector switch broken or missing.	EA		
***{Severity M}			
i. Carrier receiver is damaged or worn, but still useable.	EA		
***{Severity M}			
j. Carrier dispatcher is damaged or worn; still useable.	EA		
***{Severity M}			

06.04 PNEUMATIC TUBE ASSEMBLY

COMPONENTS (Continued)

◆ **06.04.06 STATIONS (Continued)**

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Physical Damage (Continued):**			
Observation:			
k. Security devices missing or inoperable. ***{Severity H}	EA		
l. Keypad is broken or damaged. ***{Severity H}	EA		
m. Readout display is broken or damaged. ***{Severity H}	EA		
n. Carrier receiver is damaged or worn; cannot be used. ***{Severity H}	EA		
o. Carrier dispatcher is damaged or worn; cannot be used. ***{Severity H}	EA		

Defect:

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Operation:** Based on observation of operation or on information from using or operating personnel.			
Observation:			
a. Keypad does not work. ***{Severity H}	EA		9
b. Readout display does not work. ***{Severity H}	EA		9

06.04 PNEUMATIC TUBE ASSEMBLY

COMPONENTS (Continued)

◆ **06.04.07 TRANSFER UNITS (DIVERTERS)**

Transfer units are switching devices for directing carriers from one zone to another within a multi-zone pneumatic tube assembly.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Corrosion:**			
Observation:			
a. Surface corrosion (no pitting evident).	SF		
***{Severity L}			
b. Corrosion evidenced by pitting or blistering.	SF		
***{Severity M}			
c. Corrosion evidenced by holes or loss of base metal.	SF		
***{Severity H}			

Defect:

*** Support Connections:**

Observation:

	UOM
a. Loose bolts or fasteners.	EA
***{Severity M}	
b. Broken or missing nuts, bolts, or fasteners.	EA
***{Severity H}	
c. Cracked or broken weld.	EA
***{Severity H}	

Defect:

*** Physical Damage or Movement:**

Observation:

	UOM
a. Transfer unit is dented, cracked, or damaged.	EA
***{Severity H}	
b. Transfer unit is misaligned with tubing.	EA
***{Severity H}	

06.04 PNEUMATIC TUBE ASSEMBLY

COMPONENTS (Continued)

◆ 06.04.07 TRANSFER UNITS (DIVERTERS) (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Operation:**			
Based on observation of operation or on information from using or operating personnel.			
Observation:			
a. Transfer unit leaks. ***{Severity M}	EA		
b. Transfer unit does not operate. ***{Severity H}	EA		10

Defect:

*** Paint:**			
Observation:			
a. Paint is worn; metal not showing. ***{Severity L}	SF		
b. Paint is worn; metal is showing. ***{Severity M}	SF		
c. Paint is scratched, chipped, flaked, chalked, or blistered. ***{Severity M}	SF		

06.04 PNEUMATIC TUBE ASSEMBLY

COMPONENTS (Continued)

◆ 06.04.08 CARRIERS

Carriers are containers designed to contain objects and to fit inside the carrying tube. The carriers are propelled through the system by vacuum or air pressure. Carriers are usually made of impact-resistant plastic and have hinges and latches that allow the carrier to be opened for insertion of objects or messages. Wear bands located at each end of the carrier provide for a tight air pressure seal between the carrier and the tube.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Physical Damage:**			
Observation:			
a. Carrier hinges or latch are damaged.	EA		
***{Severity L}			
b. Carrier is cracked or damaged.	EA		
***{Severity M			
c. Carrier is broken.	EA		
***{Severity H}			
d. Carrier wear bands are so worn that seal with tube is lost.	EA		
***{Severity H}			

06.04 PNEUMATIC TUBE ASSEMBLY

REFERENCES

1. DOE Condition Assessment Survey (CAS) Program, Deficiency Standards and Inspections Methods Manual, Volume 8

2. NAVFAC MO-322, Inspection of Shore Facilities

3. NAVFAC P-717.0, Engineered Performance Standards for Real Property Maintenance Activities, Preventive/Recurring Maintenance Handbook

4. MEANS Facility Cost Data, 1993, 8th Edition

5. MEANS Facilities Maintenance Standards, Roger W. Liska, PE, AIC, 1988

6. Maintenance Technology/September 1993; Write-Up Title: "Infrared Keeps All Systems Go"

7. Raining - Agema Infrared Systems; "Measurement of Excess Temperatures with Infrared Scanners"

8. KATO Engineering, Instruction Manual for Brushless Revolving Field Alternating Current Generators

9. "Handbook of Building and Plant Maintenance, Forms and Checklists" By Roger W. Liska and Judith Morrison Liska

10. Sverdrup Corporation

06.04 PNEUMATIC TUBE ASSEMBLY

LEVEL II KEY	GUIDE SHEET CONTROL NUMBER
1	GS-II 06.04.01-1
2	GS-II 06.04.02-2
3	GS-II 06.04.02-3
4	GS-II 06.04.04-4
5	GS-II 06.04.05-5
6	GS-II 06.04.05-6

LEVEL III KEY	GUIDE SHEET CONTROL NUMBER
1	GS-III 06.04.01-1
2	GS-III 06.04.02-2
3	GS-III 06.04.02-3
4	GS-III 06.04.02-4
5	GS-III 06.04.04-5
6	GS-III 06.04.04-6
7	GS-III 06.04.05-7
8	GS-III 06.04.05-8
9	GS-III 06.04.06-9
10	GS-III 06.04.07-10

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 1

COMPONENT: BLOWER
CONTROL NUMBER: GS-II 06.04.01-1

Application

This guide applies to the investigation of rattling and grinding (metal to metal) noise from the blower.

Special Safety Requirements

No special safety requirements are needed for the performance of the Level II inspection beyond those required in the Master Safety Plan and System Safety Section.

Inspection Actions

1. Observe fan operation and determine possible source of noise.
2. Shut down fan and lock out disconnect.
3. Check fan assembly for wear, damage, or loose fasteners.
4. Visually inspect blower wheel for foreign objects.
5. Return fan to normal service.

Special Tools and Equipment

Do a Level II inspection each time a Level I inspection indicates one is required.

References

1. NAVFAC MO-322, Inspection of Shore Facilities
2. MEANS Facilities Maintenance Standards, Roger W. Liska, PE, AIC, 1988

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 2

COMPONENT: MOTOR
CONTROL NUMBER: GS-II 06.04.02-2

Application

This guide applies to the investigation of the inside of an enclosure, containing bare, energized, electrical parts.

Special Safety Requirements

The following list of special safety requirements, beyond the requirements listed in the Master Safety Plan and System Safety Section, are to be observed in the performance of this inspection.

1. This inspection guide applies to enclosures containing live electrical parts having a potential of 600 volts or less above ground. If the enclosure contains circuitry of higher potential, do not use this inspection guide.

2. Any enclosure that is padlocked for safety reason is not to be opened unless okayed by the person having control of the key.

3. Inspector needs to carefully open, inspect the inside and close the enclosure without shutting down the equipment, and without creating a hazard to himself.

Inspection Actions

1. Open panels or doors carefully as required for doing the visual inspection.

2. Visually inspect for those physical damaged defects that are listed and tagged Level II Key No. as indicated above.

3. Close panels or doors carefully after the inspection is completed.

Recommended Inspection Frequency

Do a Level II inspection each time a Level I inspection indicates one is required.

References

1. Sverdrup Corporation

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 3

COMPONENT: MOTOR
CONTROL NUMBER: GS-II 06.04.02-3

Application

This guide applies to the investigation of the inside of an enclosure, containing bare, energized, electrical parts.

Special Safety Requirements

The following list of special safety requirements, beyond the requirements listed in the Master Safety Plan and System Safety Section, are to be observed in the performance of this inspection.

1. This inspection guide applies to enclosures containing live electrical parts having a potential of 600 volts or less above ground. If the enclosure contains circuitry of higher potential, do not use this inspection guide.

2. Any enclosure that is padlocked for safety reason is not to be opened unless okayed by the person having control of the key.

3. Inspector needs to carefully open, inspect the inside and close the enclosure without shutting down the equipment, and without creating a hazard to himself.

Inspection Actions

1. Open panels or doors carefully and to the degree required for scanning those devices being tested.

2. Make temperature measurements with an infrared scanner.

3. Measure the ambient temperature by measuring a spot on the inside of the enclosure that is least effected by any internal panel heat source.

4. Measure the temperature of the device specified.

5. Above-ambient temperature is calculated by subtracting the ambient temperature from the device temperature.

6. Record the results.

7. Close panels or doors carefully after the inspection is complete.

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 3 (Continued)

COMPONENT: MOTOR
CONTROL NUMBER: GS-II 06.04.02-3

Recommended Inspection Frequency

Do a Level II inspection each time a Level I inspection is made.

References

1. Maintenance Technology/September 1993; Write-up Title: *"Infrared Keeps All Systems Go"*

2. Raining - Agema Infrared Systems; *"Measurement of Excess Temperatures with Infrared Scanners"*

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 4

COMPONENT: VALVES
CONTROL NUMBER: GS-II 06.04.04-4

Application

This guide applies to the investigation of an pressure relief valve flapper that does not operate freely.

Special Safety Requirements

No special safety requirements are needed for the performance of the Level II inspection beyond those required in the Master Safety Plan and System Safety Section.

Inspection Actions

1. Inspect relief valve for external obstruction to normal operation.
2. Inspect valve for internal obstruction to normal operation.
3. Inspect valve hinge for wear, damage, or contamination that prevents normal operation.
4. Inspect valve seat for wear, damage, or contamination that prevents normal operation.
5. Record the results.

Recommended Inspection Frequency

Do a Level II inspection each time a Level I inspection indicates one is required.

References

1. DOE Condition Assessment Survey (CAS) Program, Deficiency Standards and Inspections Methods Manual, Volume 8
2. NAVFAC P-717.0, Engineered Performance Standards for Real Property Maintenance Activities, Preventive/Recurring Maintenance Handbook

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 5

COMPONENT: CONTROL CENTER
CONTROL NUMBER: GS-II 06.04.05-5

Application

This guide applies to the investigation of the inside of an enclosure, containing bare, energized, electrical parts.

Special Safety Requirements

The following list of special safety requirements, beyond the requirements listed in the Master Safety Plan and System Safety Section, are to be observed in the performance of this inspection.

1. This inspection guide applies to enclosures containing live electrical parts having a potential of 600 volts or less above ground. If the enclosure contains circuitry of higher potential, do not use this inspection guide.

2. Any enclosure that is padlocked for safety reason is not to be opened unless okayed by the person having control of the key.

3. Inspector needs to carefully open, inspect the inside and close the enclosure without shutting down the equipment, and without creating a hazard to himself.

Inspection Actions

1. Open panels or doors carefully and to the degree required for scanning those devices being tested.

2. Make temperature measurements with an infrared scanner.

3. Measure the ambient temperature by measuring a spot on the inside of the enclosure that is least effected by any internal panel heat source.

4. Measure the temperature of the device specified.

5. Above-ambient temperature is calculated by subtracting the ambient temperature from the device temperature.

6. Record the results.

7. Close panels or doors carefully after the inspection is complete.

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 5 (Continued)

COMPONENT: CONTROL CENTER
CONTROL NUMBER: GS-II 06.04.05-5

Recommended Inspection Frequency

Do a Level II inspection each time a Level I inspection is made.

References

1. Maintenance Technology/September 1993; Write-up Title: *"Infrared Keeps All Systems Go"*

2. Raining - Agema Infrared Systems; *"Measurement of Excess Temperatures with Infrared Scanners"*

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 6

COMPONENT: CONTROL CENTER
CONTROL NUMBER: GS-II 06.04.05-6

Application

This guide applies to the investigation of the inside of an enclosure, containing bare, energized, electrical parts.

Special Safety Requirements

The following list of special safety requirements, beyond the requirements listed in the Master Safety Plan and System Safety Section, are to be observed in the performance of this inspection.

1. This inspection guide applies to enclosures containing live electrical parts having a potential of 600 volts or less above ground. If the enclosure contains circuitry of higher potential, do not use this inspection guide.

2. Any enclosure that is padlocked for safety reason is not to be opened unless okayed by the person having control of the key.

3. Inspector needs to carefully open, inspect the inside and close the enclosure without shutting down the equipment, and without creating a hazard to himself.

Inspection Actions

1. Open panels or doors carefully as required for doing the visual inspection.

2. Visually inspect for those physical damaged defects that are listed and tagged Level II Key No. as indicated above.

3. Close panels or doors carefully after the inspection is completed.

Recommended Inspection Frequency

Do a Level II inspection each time a Level I inspection indicates one is required.

References

1. Sverdrup Corporation

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 1

COMPONENT: BLOWER
CONTROL NUMBER: GS-III 06.04.01-1

Application

This guide applies to the investigation of rattling and grinding (metal to metal) noise from the motor.

Special Safety Requirements

The following in a list of special safety requirements beyond those listed in the Master Safety Plan and System Safety Section.

1. Notify affected personnel and obtain permission to take unit out of service.

Inspection Actions

1. Observe operation and determine possible source of noise.
2. Shut down fan and lock out disconnect.
3. Check fan assembly for wear, damage, or loose fasteners.
4. Visually inspect blower wheel for foreign objects.
5. Return fan to normal service.

Special Tools and Equipment

The following is a list of special tools and equipment, beyond the requirements listed in the Standard Tool Section.

1. Alignment Tools
2. Vibration/ sound level meter, IDR mechanalysis #1TC87
3. Infrared scanner, Rayteck, Inc., #PM2EM-L2

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 1 (Continued)

COMPONENT: BLOWER
CONTROL NUMBER: GS-III 06.04.01-1

Recommended Inspection Frequency

Do a Level III inspection each time a Level II inspection indicates one is required.

References

1. NAVFAC MO-322 Inspection of Shore Facilities

2. Means Facilities Maintenance Standards

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 2

COMPONENT: MOTOR
CONTROL NUMBER: GS-III 06.04.02-2

Application

This guide applies to the investigation of electrical motors having excessive noise or vibration symptoms.

Special Safety Requirements

No special safety requirements are needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section.

Inspection Actions

1. Verify the findings of Level I inspection by using the vibration/sound level meter and measure the velocity (inches/second, peak), displacement (mils, peak-peak) and noise (db). Compare reading with acceptable manufacturer tolerances.

2. Inspect bearings for defects or dryness.

3. Inspect electrical motor and load unit for misalignment.

4. Inspect electrical motor and load unit for proper mounting.

5. Inspect electrical motor and load unit for transfer of vibration from another source.

6. Inspect coupling for loose connection.

7. If none of the above is the problem, reference manufacturer troubleshooting guide for additional inspections or repairs to be made.

Special Tools and Equipment

The following is a list of special tools required beyond those listed in the Standard Tool Section.

1. Vibration/sound level meter, IDR Mechanalysis #1TC87

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 2 (Continued)

COMPONENT: MOTORS
CONTROL NUMBER: GS-III 06.04.02-2

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level I inspection.

References

1. KATO Engineering, Instruction Manual for Brushless Revolving Field Alternating Current Generators

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 3

COMPONENT: MOTOR
CONTROL NUMBER: GS-III 06.04.02-3

Application

This guide applies to the investigation of excessive sparking at the collector rings, commutator or brushes.

Special Safety Requirements

No special safety requirements are needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section.

Inspection Actions

Level I Inspector will detect excessive sparking in the area of either the collector rings, commutator or brushes. Level III Inspector will perform the following tasks.

1. Verify that there is excessive sparking in the area of either the collector rings, commutator or brushes.

2. If there is a problem, stop the motor and evaluate the problems causing the sparking.

3. Classify the severity of the problem and recommend the procedure needed to correct the problem.

4. If the Level III Inspector can not evaluate the problem, recommend the next procedure required to further identify the correction procedure that needs to be followed.

Special Tools and Equipment

The following is a list of special tools required beyond those listed in the Standard Tool Section.

1. Wrenches

2. Feelers

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 3 (Continued)

COMPONENT: MOTOR
CONTROL NUMBER: GS-III 06.04.02-3

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level I inspection.

References

1. *"Handbook of Building and Plant Maintenance, Forms and Checklists"* by Roger W. Liska and Judith Morrison Liska

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 4

COMPONENT: MOTOR
CONTROL NUMBER: GS-III 06.04.02-4

Application

This guide applies to the investigation of a hot terminal or device that is overheating from the flow of current through that terminal or device.

Special Safety Requirements

No special safety requirements are needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section.

Inspection Actions

1. Verify the findings of Level II inspection by using the Infrared Scanner and measuring the temperatures of the device and terminals. If the device or terminals are not hot as indicated by the findings of Level II inspection, check the current flow through the device or terminals. Heat generated is proportionate to the square of the current. If there is little or no current flow through the device or terminal at the time of measurement, there will be no significant amount of heat generated.

2. For terminal connections, verify the type of conductor being terminated. If the conductor is an aluminum conductor, look for evidence of cold flow or melt down of conductor.

3. If there is evidence of cold flow or melt down of the aluminum conductor, the conductor should either be replaced or shortened and reconnected. When making new aluminum conductor terminations a joint compound should be used.

4. If the terminal is loose it should be tightened. De-energize prior to attempting tightening of terminal connections.

5. If none of the above is the problem than there is an internal problem and an on-site analysis must be made to determine if additional inspections are to be made or the unit is to be replaced.

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 4 (Continued)

COMPONENT: MOTOR
CONTROL NUMBER: GS-III 06.04.02-4

Special Tools and Equipment

The following is a list of special tools required beyond those listed in the Standard Tool Section.

1. Infrared Scanner, Raytek, Inc., #PM2EM-L2

2. Torque wrench

3. Digital Multimeter, Fluke #1TC676

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level II inspection.

References

1. Maintenance Technology/September 1993; Write-up Title: *"Infrared Keeps All Systems Go"*

2. Raining - Agema Infrared Systems; *"Measurement of Excess Temperatures with Infrared Scanners"*

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 5

COMPONENT: VALVES
CONTROL NUMBER: GS-III 06.04.04-5

Application

This guide applies to the investigation of a vacuum bypass valve that does not operate properly.

Special Safety Requirements

No special safety requirements are needed for the performance of the Level III inspection beyond those required in the Master Safety Plan and System Safety Section.

Inspection Actions

1. Inspect vacuum bypass valve for external obstruction to normal operation.

2. Inspect valve for internal obstruction to normal operation.

3. Inspect valve operator for wear, damage, or contamination that prevents normal operation.

4. Inspect valve and operator in accordance with the manufacturer's Operation and Maintenance Manual.

5. Record the results.

Special Tools and Equipment

The following is a list of special tools required beyond those listed in the Standard Tool Section.

1. Special tools as recommended by the equipment manufacturer.

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level I inspection.

References

1. DOE Condition Assessment Survey (CAS) Program, Deficiency Standards and Inspections Methods Manual, Volume 8

2. NAVFAC P-717.0, Engineered Performance Standards for Real Property Maintenance Activities, Preventive/Recurring Maintenance Handbook

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 6

COMPONENT: VALVES
CONTROL NUMBER: GS-III 06.04.04-6

Application

This guide applies to the investigation of a shift valve that does not operate properly.

Special Safety Requirements

No special safety requirements are needed for the performance of the Level III inspection beyond those required in the Master Safety Plan and System Safety Section.

Inspection Actions

1. Inspect shift valve for external obstruction to normal operation.

2. Inspect valve for internal obstruction to normal operation.

3. Inspect valve operator for wear, damage, or contamination that prevents normal operation.

4. Inspect valve and operator in accordance with the manufacturer's Operation and Maintenance Manual.

5. Record the results.

Special Tools and Equipment

The following is a list of special tools and equipment, beyond the requirements listed in the Standard Tool Section.

1. Wrenches

2. Screwdrivers

3. Special tools as recommended by the equipment manufacturer.

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level I inspection.

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 6 (Continued)

COMPONENT: VALVES
CONTROL NUMBER: GS-III 06.04.04-6

References

1. DOE Condition Assessment Survey (CAS) Program, Deficiency Standards and Inspections Methods Manual, Volume 8

2. NAVFAC P-717.0, Engineered Performance Standards for Real Property Maintenance Activities, Preventive/Recurring Maintenance Handbook

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 7

COMPONENT: CONTROL CENTER
CONTROL NUMBER: GS-III 06.04.05-7

Application

This guide applies to the investigation of a hot terminal or device that is overheating from the flow of current through that terminal or device.

Special Safety Requirements

No special safety requirements are needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section.

Inspection Actions

1. Verify the findings of Level II inspection by using the Infrared Scanner and measuring the temperatures of the device and terminals. If the device or terminals are not hot as indicated by the findings of Level II inspection, check the current flow through the device or terminals. Heat generated is proportionate to the square of the current. If there is little or no current flow through the device or terminal at the time of measurement, there will be no significant amount of heat generated.

2. For terminal connections, verify the type of conductor being terminated. If the conductor is an aluminum conductor, look for evidence of cold flow or melt down of conductor.

3. If there is evidence of cold flow or melt down of the aluminum conductor, the conductor should either be replaced or shortened and reconnected. When making new aluminum conductor terminations a joint compound should be used.

4. If the terminal is loose it should be tightened. De-energize prior to attempting tightening of terminal connections.

5. If none of the above is the problem than there is an internal problem and an on-site analysis must be made to determine if additional inspections are to be made or the unit is to be replaced.

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 7 (Continued)

COMPONENT: CONTROL CENTER
CONTROL NUMBER: GS-III 06.04.05-7

Special Tools and Equipment

The following is a list of special tools required beyond those listed in the Standard Tool Section.

1. Infrared Scanner, Raytek, Inc., #PM2EM-L2
2. Torque wrench
3. Digital Multimeter, Fluke #1TC676

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level II inspection.

References

1. Maintenance Technology/September 1993; Write-up Title: *"Infrared Keeps All Systems Go"*
2. Raining - Agema Infrared Systems; *"Measurement of Excess Temperatures with Infrared Scanners"*

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 8

COMPONENT: CONTROL CENTER
CONTROL NUMBER: GS-III 06.04.05-8

Application

This guide applies to the investigation of a solid state or computer related device that does not operate properly.

Special Safety Requirements

No special safety requirements are needed for the performance of the Level III inspection beyond those required in the Master Safety Plan and System Safety Section.

Inspection Actions

1. Inspect the device in accordance with the manufacturer's operation and maintenance manual.

2. Engage the manufacturer's authorized maintenance service or other competent service organization to troubleshoot and repair the device.

Special Tools and Equipment

The following is a list of special tools are required beyond those listed in the Standard Tool Section.

1. Special tools as recommended by the device manufacturer.

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level I inspection.

References

1. Sverdrup Corporation

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 9

COMPONENT: CONTROL CENTER
CONTROL NUMBER: GS-III 06.04.06-9

Application

This guide applies to the investigation of a solid state or computer related device that does not operate properly.

Special Safety Requirements

No special safety requirements are needed for the performance of the Level III inspection beyond those required in the Master Safety Plan and System Safety Section.

Inspection Actions

1. Inspect the device in accordance with the manufacturer's operation and maintenance manual.

2. Engage the manufacturer's authorized maintenance service or other competent service organization to troubleshoot and repair the device.

Special Tools and Equipment

The following is a list of special tools are required beyond those listed in the Standard Tool Section.

1. Special tools as recommended by the device manufacturer.

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level I inspection.

References

1. Sverdrup Corporation

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 10

COMPONENT: TRANSFER UNITS
CONTROL NUMBER: GS-III 06.04.07-10

Application

This guide applies to the investigation of a transfer unit that does not operate properly.

Special Safety Requirements

No special safety requirements are needed for the performance of the Level III inspection beyond those required in the Master Safety Plan and System Safety Section.

Inspection Actions

1. Inspect transfer unit for internal obstruction to normal operation.
2. Inspect transfer unit for wear, damage, or contamination that prevents normal operation.
3. Inspect transfer unit in accordance with the manufacturer's Operation and Maintenance Manual.
4. Record the results.

Special Tools and Equipment

The following is a list of special tools and equipment, beyond the requirements listed in the Standard Tool Section.

1. Screwdrivers
2. Wrenches
3. Special tools as recommended by the equipment manufacturer.

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level I inspection.

References

1. Sverdrup Corporation

06.05 MOVING WALKS

DESCRIPTION

Moving Walks are a subsystem of Building Conveying Systems. They are a type of passenger-carrying device on which people stand or walk and the carrying surface remains parallel with the floor surface and its direction of motion. Motor-driven sprockets and chains continuously drive an endless belt in a loop between the ends of the Moving Walk. Moving Walks are used primarily for personnel transportation service. They provide a means of moving large numbers of people over long distances in a short time.

This system includes a supporting structure, an endless belt, a handrail assembly, a drive assembly, and equipment panel and controls.

SPECIAL TOOL AND EQUIPMENT REQUIREMENTS

No special tools are needed for the inspection of Moving Walks beyond those listed in the Standard Tools Section.

SPECIAL SAFETY REQUIREMENTS

The following special safety requirements, beyond those listed in the Master Safety Plan and System Safety Section, are necessary to perform the inspection of the Moving Walks.

1. Threshold plates at both ends of the Moving Walk must be removed to permit inspection of the drive and belt return machinery. The facility manager must provide personnel to remove the plates and to provide barricades for this part of the inspection.

2. Locate safety barricade both ends of the Moving Walk.

3. Before entering the Moving Walk machinery spaces, at either the end of the unit, disconnect the electric power from the Moving Walk driving machine and brake by opening the safety stop switch or mainline disconnect switch. The disconnect switch may be in the machinery space or in a remote location. Lock the disconnect switch in the open position with a padlock.

COMPONENT LIST

- ◆ 06.05.01 HANDRAIL ASSEMBLY
- ◆ 06.05.02 MOTOR AND DRIVE ASSEMBLY
- ◆ 06.05.03 STRUCTURE
- ◆ 06.05.04 CONTROLS

06.05 MOVING WALKS

RELATED SUBSYSTEMS

Due to the related nature of the elements requiring inspection, the following systems and subsystems should be reviewed for concurrent inspection.

02.02	FLOOR FRAMING AND DECK
05.05	INTERIOR FLOOR/FLOOR COVERING
10.02	LOW VOLTAGE DIST. SYSTEM 600v OR LESS

STANDARD INSPECTION PROCEDURE

Moving Walk inspection requires both Level I and Level II inspections as part of the basic inspection process. Additional Level II or Level III inspections may be indicated or "triggered" by Level I defect observations. Any additional Level II inspections should be accomplished by the inspector at the time of the Level I inspection. Associated defects and observations, for each major component of the Moving Walk, are listed in the inspector's Data Collection Device.

06.05 MOVING WALKS

COMPONENTS

◆ 06.05.01 HANDRAIL ASSEMBLY

The handrail assembly consists of the balustrades, which form the sides of the Moving Walk, and the moving handrail, which rides on top of and passes through the balustrades. The balustrades serve as guide walls and form the support structure for the moving handrail. Balustrade skirts form a tight intersection between the balustrade and the Moving Walk carrying surface. Clearance between the balustrades and the carrying surface must be no more then 1/4". This dimension applies whether the clearance space is at the top or the side of the carrying surface. Balustrades must be rigid and non-perforated. They may be made of metal, glass, or plastic. Glass balustrade panels may be transparent. Plastic panels must be bonded to a basic supporting panel. The handrail should move at the same speed as the carrying surface to allow for a single passenger grip during transit. The handrail is generally made of rubber or a flexible synthetic material. The handrail is built into the balustrade with the grip portion riding on top and the return portion going through or under the balustrade. The handrail entrance to and exit from the balustrade is equipped with finger/hand guards. It is typically driven like a v-belt using friction sheaves activated by the main drive assembly.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Physical Wear and Damage:**			
Observation:			
a. Cracked, broken, or dented balustrade panels.	EA		
***{Severity L}			
b. Loose or missing nuts, bolts, and fasteners.	EA		
***{Severity L}			
c. Loose, bent, or broken skirt panels.	EA		
***{Severity M}			
d. Projecting, burred, or damaged nuts, bolts, or fasteners.	EA		
***{Severity M}			
e. Handrail is damaged or worn but not interfering with operation.	EA		
***{Severity M}			
f. Handrail guards loose, dented, or bent.	EA		
***{Severity M}			
g. Finger/hand guards loose, bent, or broken.	EA		
***{Severity M}			

06.05 MOVING WALKS

COMPONENTS (Continued)

◆ 06.05.01 HANDRAIL ASSEMBLY (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Physical Wear and Damage (Continued):**			
Observation:			
h. Missing balustrade panels.	EA		
***{Severity H}			
i. Loose balustrade panels.	EA		
***{Severity H}			
j. Missing skirt panels.	EA		
***{Severity H}			
k. Handrail damaged or worn and interferes with operation.	EA		
***{Severity H}			
l. Handrail splice or joint is loose or rough.	EA		
***{Severity H}			
m. Handrail guards missing, broken or out of position.	EA		
***{Severity H}			
n. Finger/hand guards missing.	EA		
***{Severity H}			

Defect:

*** Operation:**			
Observation:			
a. Handrail operation jerky or speed variable.	EA	1	
***{Severity M}			
b. Handrail speed substantially different from speed of walkway.	EA	1	
***{Severity M}			
c. Handrail not operating.	EA	2	
***{Severity H}			

06.05 MOVING WALKS

COMPONENTS (Continued)

◆ 06.05.02 MOTOR AND DRIVE ASSEMBLY

The Moving Walk motor and drive assembly consists of an electric drive motor, gear reducer, brake assembly, sprockets and drive chain, or belt and rollers, and the track assembly. These components provide and transmit the motive force to the carrying surface. The track assembly provides the path around which the belt travels. The track assembly also includes the belt tension carriage, main drive shaft and the handrail drive.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Walkway Belt:**			
Observation:			
a. Belt operation is jerky or speed variable.	EA	3	
***{Severity M}			
b. Belt is wobbly or sags during ride.	EA		1
***{Severity M}			
c. Belt tracks to one side during operation.	EA	4	
***{Severity M}			
d. Belt splice broken, cracked, or otherwise damaged.	EA		
***{Severity H}			
e. Belt surface is worn is worn with loss of traction.	EA		
***{Severity H}			

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Motor:**			
Note that all inspections are Level II in that they require access to machinery spaces.			
Observation:			
a. Surface corrosion (no pitting evident).	SF	5	
***{Severity L}			
b. Motor housings contaminated.	EA	5	
***{Severity L}			
c. Terminal box cover missing.	EA	5	
***{Severity L}			
d. Excessively noisy.	EA	5	2
***{Severity M }			
e. Corrosion evidenced by pitting or blistering.	SF	5	
***{Severity M}			
f. Machine air passage dirty or clogged.	EA	5	
***{Severity M}			

06.05 MOVING WALKS

COMPONENTS (Continued)

◆ 06.05.02 MOTOR AND DRIVE ASSEMBLY (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Motor (Continued):**			
g. Motor frame cracked or broken. ***{Severity M}	EA	5	
h. Motor support cracked or broken. ***{Severity M}	EA	5	
i. Motor support shifted. ***{Severity M}	EA	5	
j. Defective mounting pads. ***{Severity M}	EA	5	
k. Excessive vibration. ***{Severity M}	EA	5	2
l. Excessive sparking at the collector rings, commutator, or brushes. ***{Severity M}	EA	5	3
m. Insulation of motor leads damaged or deteriorated. ***{Severity M}	EA	6	
n. Taping improperly installed or deteriorated. ***{Severity M}	EA	6	
o. Terminal 5° to 24°C above ambient. ***{Severity M}	EA	7	4
p. Corrosion evidenced by holes or loss of base metal. ***{Severity H}	EA	5	
q. Loose or missing mounting bolts. ***{Severity H}	EA	5	
r. Terminal 25°C or more above ambient. ***{Severity H}	EA	7	4
s. Unit not grounded. ***{Severity H}	EA	6	
t. Moving walks-motor/drive assembly-terminal connection inadequate.	EA		

06.05 MOVING WALKS

COMPONENTS (Continued)

◆ 06.05.02 MOTOR AND DRIVE ASSEMBLY (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Gear Reducer:**			
Note that all inspections are Level II in that they require access to machinery spaces.			
Observation:			
a. Gear reducer housing has surface rust, no pitting evident.	SF	5	
***{Severity L}			
b. Oil dipstick missing or damaged.	EA	5	
***{Severity L}			
c. Gear reducer corrosion with pitting and blistering of base metal.	SF	5	
***{Severity M}			
d. Gear reducer housing cracked, dented, or otherwise damaged.	EA	5	
***{Severity M}			
e. Oil leak at bearing or shaft seals.	EA	5	
***{Severity M}			
f. Gear reducer corrosion with loss of base metal.	SF	5	
***{Severity H}			
g. Oil lubrication connection missing or damaged.	EA	5	
***{Severity H}			
h. Oil leak at housing gasket.	EA	5	
***{Severity H}			
i. Unit vibrates or makes loud or unusual noise during operation.	EA	5	5
***{Severity H}			
j. Damaged, loose, or missing nuts, bolts or fasteners.	EA	5	
***{Severity H}			

06.05 MOVING WALKS

COMPONENTS (Continued)

◆ 06.05.02 MOTOR AND DRIVE ASSEMBLY (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Brake Assembly:**			
Note that all inspections are Level II in that they require access to machinery spaces.			
Observation:			
a. Brake Assembly parts have surface rust, no pitting evident.	SF	5	
***{Severity L}			
b. Parts have corrosion with pitting and blistering of base metal.	SF	5	
***{Severity M}			
c. Parts have corrosion with loss of base metal.	SF	5	
***{Severity H}			
d. Brake assembly parts are loose, cracked, or broken.	EA	5	
***{Severity H}			
e. Damaged, loose, or missing nuts, bolts, or fasteners.	EA	5	
***{Severity H}			

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Sprocket and Drive Chain:**			
Note that all inspections are Level in that they require access to machinery spaces.			
Observation:			
a. Sprocket loose or not square with shaft.	EA	5	
***{Severity M}			
b. Sprocket teeth worn with distortion of tooth shape.	EA	5	
***{Severity M}			
c. Drive chain parts worn with distortion of part shape.	EA	5	
***{Severity M}			
d. Sprocket teeth or drive chain parts cracked or broken.	EA	5	
***{Severity H}			
e. Oil lubrication system empty, damaged, or not working.	EA	5	
***{Severity H}			

06.05 MOVING WALKS

COMPONENTS (Continued)

◆ 06.05.03 STRUCTURE

The Moving Walk structure consists of the truss, truss supports, threshold plates, and track assembly. The truss is a welded steel frame work that provides a rigid stable support for the Moving Walk mechanism. Truss supports consist of flexible vibration isolation cushions at the drive and return ends and vertical steel posts or stanchions for the track sections. Vibration isolation cushions are designed to prevent transmission of vibration and noise from the truss to the building structure. Threshold plates cover the service areas at each end of the Moving Walk and form the transition between the floor surface and the Moving Walk entrance or exit. The threshold plates; also called floor cover plates, are of metal construction and are designed with a rigid, skid proof surface to provide a safe foothold as the passenger approaches or leaves the Moving Walk. They also provide access to the mechanical equipment spaces. The transition between the threshold plates and the Moving Walk carrying surface or belt is provided by comb plates. Flat or slightly curved ribbed combs on the comb plate extend into the grooves in the belt to ensure a smooth transfer from the moving to the stationary part of the Moving Walk.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Operation:**			
Observation:			
a. Underside of comb plate teeth above top of belt ribs.	EA		
***{Severity H}			
b. Comb plate is in contact with belt ribs.	EA		
***{Severity H}			

Defect:

*** Physical Wear or Damage:**			
Observation:			
a. Threshold plates or comb plates are loose, cracked or broken.	EA		
***{Severity M}			
b. Comb plate teeth are bent, cracked, or missing.	EA		
***{Severity M}			
c. Threshold plates or comb plates are missing.	EA		
***{Severity H}			
d. Threshold or comb plate surface worn with loss of traction.	SF		
***{Severity H}			
e. Damaged, loose, or missing nuts, bolts, or fasteners.	EA		
***{Severity H}			

06.05 MOVING WALKS

COMPONENTS (Continued)

◆ 06.05.03 STRUCTURE (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Truss and Supports (at access plates):** Note that all inspections are Level II in that they require access to machinery spaces.			
Observation:			
a. Truss supports or support components missing or damaged. ***{Severity M}	EA		
b. Truss member missing, bent, cracked or out of alignment. ***{Severity H}	EA	8	
c. Truss welds have cracks. ***{Severity H}	EA	8	

Defect:

*** Corrosion:** Note that all inspections are Level II in that they require access to machinery spaces.			
Observation:			
a. Truss has surface rust, no pitting evident. ***{Severity L}	SF	8	
b. Truss corrosion with pitting and blistering of base material. ***{Severity M}	SF	8	
c. Truss corrosion with loss of base material. ***{Severity H}	SF	8	

06.05 MOVING WALKS

COMPONENTS (Continued)

◆ 06.05.04 CONTROLS

Moving Walk controls provide for the automatic and safe operation of the unit. Emergency stop control stations are located on the balustrade at each end of the Moving Walk. The emergency stop control station will have pilot lights and pushbuttons or switches for emergency control of the Moving Walk. The pushbuttons or switches will be protected with covers or other devices against accidental operation. The control panel, housing the overall monitoring and control of the Moving Walk unit, is usually located in the machine space at the one end of the Moving Walk truss. (Some Moving Walks may have control panels located at both ends of the truss.) The control panel consists of pilot lights, meters, audible alarms, etc. to monitor the Moving Walk and pushbuttons, switches, relays, and a microprocessor to control the Moving Walk. The control panel will have a socket for connecting a hand held pendent hand control for use during maintenance.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Corrosion - Control Station:**			
Observation:			
a. Surface corrosion (no pitting evident).	SF		
***{Severity L}			
b. Corrosion evidenced by pitting or blistering.	SF		
***{Severity M}			
c. Corrosion evidenced by holes or loss of base metal.	SF		
***{Severity H}			

Defect:

*** Physical Damage - Control Station:**			
Observation:			
a. Loose enclosure mounting.	EA		
***{Severity L}			
b. Indicating lamp inoperable.	EA		
***{Severity L}			
c. Indicating lens broken or missing.	EA		
***{Severity L}			
d. Enclosure damaged (cannot be sealed).	EA		
***{Severity M}			
e. Unused opening not covered.	EA		
***{Severity M}			
f. Pushbutton broken or missing.	EA		
***{Severity M}			
g. Selector switch broken or missing.	EA		
***{Severity M}			
h. Security devices missing or inoperable.	EA		
***{Severity H}			

06.05 MOVING WALKS

COMPONENTS (Continued)

◆ 06.05.04 CONTROLS (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Control Panel Corrosion:**			
Note that all inspections are Level II in that they require access to machinery spaces.			
Observation:			
a. Surface corrosion (no pitting evident). ***{Severity L}	SF	9	
b. Corrosion evidenced by pitting or blistering. ***{Severity M}	SF	9	
c. Corrosion evidenced by holes or loss of base metal. ***{Severity H}	EA	9	

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Physical Damage - Control Panel:**			
Observation:			
a. Loose enclosure mounting. ***{Severity L}	EA	9	
b. Panel fastener loose, broken or missing. ***{Severity L}	EA	9	
c. Indicating lamp inoperable. ***{Severity L}	EA	9	
d. Indicating lens broken or missing. ***{Severity L}	EA	9	
e. Enclosure damaged (cannot be sealed). ***{Severity M}	EA	9	
f. Unused opening not covered. ***{Severity M}	EA	9	
g. Pushbutton broken or missing. ***{Severity M}	EA	9	
h. Selector switch broken or missing. ***{Severity M}	EA	9	
i. Transformer discolored or blistered due to overheating. ***{Severity M}	EA	11	
j. Security devices missing or inoperable. ***{Severity H}	EA	9	
k. Door handle bent or inoperable. ***{Severity H}	EA	9	

06.05 MOVING WALKS

COMPONENTS (Continued)

◆ 06.05.04 CONTROLS (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Hot Spots - Control Panel:** Note that all inspections are Level II in that they require access to machinery spaces. Observation:			
a. Control transformer 5° to 24°C above ambient. ***{Severity M}	EA	10	6
b. Control transformer 25°C or more above ambient. ***{Severity H}	EA	10	6

06.05 MOVING WALKS

REFERENCES

1. ANSI A17.1 Safety Code for Elevators, Dumbwaiters, Escalators, and Moving Walks

2. ANSI A17.2 Practice for the Inspection of Elevators, Escalators, and Moving Walks

3. Maintenance Technology/September 1993; Write-Up Title: "Infrared Keeps All Systems Go"

4. Raining - Agema Infrared Systems; "Measurement of Excess Temperatures with Infrared Scanners"

5. KATO Engineering, Instruction Manual for Brushless Revolving Field Alternating Current Generators

6. Owners Manual, Schindler Elevator Corporation

7. Operating Instructions, Dover Elevator Systems

8. SPEEDWALK - SPEEDRAMP Operation Instructions, Westmont Industries

9. "Handbook of Building and Plant Maintenance, Forms and Checklists" by Roger W. Liska and Judith Morrison Liska

10. Belt Conveyors for Bulk Materials, Second Edition, Conveyor Equipment Manufacturers Association

11. Mark's Standard Handbook for Mechanical Engineers, Eugene A. Avallone and Theodore Baumeister III, Ninth Edition, McGraw-Hill Book Company

12. Sverdrup Corporation

06.05 MOVING WALKS

LEVEL II KEY	GUIDE SHEET CONTROL NUMBER
1	GS- II 06.05.01-1
2	GS- II 06.05.01-2
3	GS- II 06.05.02-3
4	GS- II 06.05.02-4
5	GS- II 06.05.02-5
6	GS- II 06.05.02-6
7	GS- II 06.05.02-7
8	GS- II 06.05.03-8
9	GS- II 06.05.04-9
10	GS- II 06.05.04-10
11	GS- II 06.05.04-11

LEVEL III KEY	GUIDE SHEET CONTROL NUMBER
1	GS-III 06.05.02-1
2	GS-III 06.05.02-2
3	GS-III 06.05.02-3
4	GS-III 06.05.02-4
5	GS-III 06.05.02-5
6	GS-III 06.05.04-6

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 1

COMPONENT: HANDRAIL ASSEMBLY
CONTROL NUMBER: GS-II 06.05.01-1

Application

This guide applies to the investigation of moving a walk handrail that has a speed substantially different from the speed of the walkway, that is jerky, or has a variable speed.

Special Safety Requirements

1. The facility manager must provide personnel to stop the moving walk, remove the threshold plates, and to provide barricades for this part of the inspection.

2. Barricades must be provided at the ends of the moving walk while the threshold plates are removed.

3. The facility manager must provide personnel to replace the threshold plates, remove the barricades, and start the moving walk when the inspection is complete.

Inspection Items

1. Inspect handrail in drive and return areas for indication that the handrail is slipping.

2. Inspect handrail drive wheel friction lining for adequate thickness (at least 3mm).

3. Inspect tension rollers for proper adjustment.

4. Inspect handrail drive for indications of loose chain or sprockets.

5. Inspect handrail drive for worn or loose v-belts

6. Record the results.

Recommended Inspection Frequency

Do a Level II inspection each time a Level I inspection indicates one is required.

Reference

1. ANSI A17.1 Safety Code For Elevators, Dumbwaiters, Escalators, and Moving Walks

2. ANSI A17.2 Practices for the Inspection of Elevators, Escalators, and Moving Walks

3. Owners Manual, Schindler Elevator Corporation

4. Operating Instructions, Dover Elevator Systems

5. SPEEDWALK - SPEEDRAMP Operation Instructions, Westmont Industries

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 2

COMPONENT: HANDRAIL ASSEMBLY
CONTROL NUMBER: GS-II 06.05.01-2

Application

This guide applies to the investigation of a moving walk handrail that is not operating.

Special Safety Requirements

1. The facility manager must provide personnel to stop the moving walk, remove the threshold plates, and to provide barricades for this part of the inspection.

2. Barricades must be provided at the ends of the moving walk while the threshold plates are removed.

3. The facility manager must provide personnel to replace the threshold plates, remove the barricades, and start the moving walk when the inspection is complete.

Inspection Items

1. Inspect handrail in drive and return areas for indication that the handrail is broken or slipping.

2. Inspect handrail drive wheel friction lining for adequate thickness (at least 3mm).

3. Inspect tension rollers for proper adjustment.

4. Inspect handrail drive for broken chain or loose sprocket.

5. Record the results.

Recommended Inspection Frequency

Do a Level II inspection each time a Level I inspection indicates one is required.

References

1. ANSI A17.1 Safety Code For Elevators, Dumbwaiters, Escalators, and Moving Walks

2. ANSI A17.2 Practices for the Inspection of Elevators, Escalators, and Moving Walks

3. Owners Manual, Schindler Elevator Corporation

4. Operating Instructions, Dover Elevator Systems

5. SPEEDWALK - SPEEDRAMP Operation Instructions, Westmont Industries

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 3

COMPONENT: MOTOR AND DRIVE ASSEMBLY
CONTROL NUMBER: GS-II 06.05.02-3

Application

This guide applies to the investigation of a moving walk belt with jerky or variable speed operation.

Special Safety Requirements

1. The facility manager must provide personnel to stop the moving walk, remove the threshold plates, and to provide barricades for this part of the inspection.

2. Barricades must be provided at the ends of the moving walk while the threshold plates are removed.

3. The facility manager must provide personnel to replace the threshold plates, remove the barricades, and start the moving walk when the inspection is complete.

Inspection Items

1. Inspect belt drive motor and gear reducer for indication of irregular output speed.

2. Inspect for loose drive coupling.

3. Inspect drive chain for proper tension.

4. Inspect belt tension device for proper adjustment.

5. Record the results.

Recommended Inspection Frequency

Do a Level II inspection each time a Level I inspection indicates one is required.

References

1. ANSI A17.1 Safety Code For Elevators, Dumbwaiters, Escalators, and Moving Walks

2. ANSI A17.2 Practices for the Inspection of Elevators, Escalators, and Moving Walks

3. Owners Manual, Schindler Elevator Corporation

4. Operating Instructions, Dover Elevator Systems

5. SPEEDWALK - SPEEDRAMP Operation Instructions, Westmont Industries

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 4

COMPONENT: MOTOR AND DRIVE ASSEMBLY
CONTROL NUMBER: GS-II 06.05.02-4

Application

This guide applies to investigation of a moving walk belt that tracks to one side during operation..

Special Safety Requirements

1. The facility manager must provide personnel to stop the moving walk, remove the threshold plates, and to provide barricades for this part of the inspection.

2. Barricades must be provided at the ends of the moving walk while the threshold plates are removed.

3. The facility manager must provide personnel to replace the threshold plates, remove the barricades, and start the moving walk when the inspection is complete.

Inspection Items

1. Inspect belt tension for proper adjustment.

2. Inspect tail pulley for proper alignment.

3. Inspect head pulley and tail pulley for loose hub.

4. Inspect belt for evidence of uneven stretching.

5. Record the results.

Recommended Inspection Frequency

Do a Level II inspection each time a Level I inspection indicates one is required.

References

1. Belt Conveyors for Bulk Materials, Second Edition, Conveyor Equipment Manufacturers Association

2. Marks' Standard Handbook for Mechanical Engineers, Eugene A. Avallone and Theodore Baumeister I, Ninth Edition, McGraw-Hill Book Company

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 5

COMPONENT: MOTOR AND DRIVE ASSEMBLY
CONTROL NUMBER: GS-II 06.05.02-5

Application

This guide applies to inspection of components located in the machine spaces under the moving walk.

Special Safety Requirements

1. The facility manager must provide personnel to stop the moving walk, remove the threshold plates, and to provide barricades for this part of the inspection.

2. Barricades must be provided at the ends of the moving walk while the threshold plates are removed.

3. The facility manager must provide personnel to replace the threshold plates, remove the barricades, and start the moving walk when the inspection is complete.

Inspection Items

Inspect all components and sub-components identified with the Level II Key No 5.

Recommended Inspection Frequency

Do a Level II inspection each time a Level I inspection indicates one is required.

References

1. Sverdrup Corporation

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 6

COMPONENT: MOTOR AND DRIVE ASSEMBLY
CONTROL NUMBER: GS-II 06.05.02-6

Application

This guide applies to the investigation of the inside of an enclosure, containing bare, energized, electrical parts.

Special Safety Requirements

The following list of special safety requirements, beyond the requirements listed in the Master Safety Plan and System Safety Section, are to be observed in the performance of this inspection.

1. The facility manager must provide personnel to stop the escalator, remove the threshold plates, and to provide barricade for this part of the inspection.

2. Barricades must be provided at the ends of the escalator while the threshold plates are removed.

3. This inspection guide applies to enclosures containing live electrical parts having a potential of 600 volts or less above ground. If the enclosure contains circuitry of higher potential, do not use this inspection guide.

4. Any enclosure that is padlocked for safety reason is not to be opened unless okayed by the person having control of the key.

5. Inspector needs to carefully open, inspect the inside and close the enclosure without shutting down the equipment, and without creating a hazard to himself.

6. The facility manager must provide personnel to replace the threshold plates, remove the barricades, and start the escalator when the inspection is complete.

Inspection Actions

1. Open panels or doors carefully as required for doing the visual inspection.

2. Visually inspect for those physical damaged defects that are listed and tagged Level II Key No. as indicated above.

3. Close panels or doors carefully after the inspection is completed.

Recommended Inspection Frequency

Do a Level II inspection each time a Level I inspection indicates one is required.

References

1. Sverdrup Corporation

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 7

COMPONENT: MOTOR AND DRIVE ASSEMBLY
CONTROL NUMBER: GS-II 06.05.02-7

Application

This guide applies to the investigation of the inside of an enclosure, containing bare, energized, electrical parts.

Special Safety Requirements

The following list of special safety requirements, beyond the requirements listed in the Master Safety Plan and System Safety Section, are to be observed in the performance of this inspection.

1. The facility manager must provide personnel to stop the escalator, remove the threshold plates, and to provide barricade for this part of the inspection.

2. Barricades must be provided at the ends of the escalator while the threshold plates are removed.

3. This inspection guide applies to enclosures containing live electrical parts having a potential of 600 volts or less above ground. If the enclosure contains circuitry of higher potential, do not use this inspection guide.

4. Any enclosure that is padlocked for safety reasons is not to be opened unless okayed by the person having control of the key.

5. Inspector needs to carefully open, inspect the inside and close the enclosure without shutting down the equipment, and without creating a hazard to himself.

6. The facility manager must provide personnel to replace the threshold plates, remove the barricades, and start the escalator when the inspection is complete.

Inspection Actions

1. Open panels or doors carefully as required for scanning those devices being tested.

2. Make temperature measurements with an infrared scanner.

3. Measure the ambient temperature by measuring a spot on the inside of the enclosure that is least effected by any internal panel heat source.

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 7 (Continued)

COMPONENT: MOTOR AND DRIVE ASSEMBLY
CONTROL NUMBER: GS-II 06.05.02-7

Inspection Actions (Continued)

4. Measure the temperature of the device specified.

5. Above ambient temperature is calculated by subtracting the ambient temperature from the device temperature.

6. Record the results.

7. Close panels or doors carefully after the inspection is complete.

Recommended Inspection Frequency

Do a Level II inspection each time a Level I inspection indicates one is required.

References

1. Maintenance Technology/September 1993; Write-up Title: "Infrared Keeps All Systems Go"

2. Raining - Agema Infrared Systems; "Measurement of Excess Temperatures with Infrared Scanners"

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 8

COMPONENT: STRUCTURE
CONTROL NUMBER: GS-II 06.05.03-8

Application

This guide applies to inspection of components located in the machine spaces under the moving walk.

Special Safety Requirements

1. The facility manager must provide personnel to stop the moving walk, remove the threshold plates, and to provide barricades for this part of the inspection.

2. Barricades must be provided at the ends of the moving walk while the threshold plates are removed.

3. The facility manager must provide personnel to replace the threshold plates, remove the barricades, and start the moving walk when the inspection is complete.

Inspection Items

Inspect all components and sub-components identified with the Level II Key No 8.

Recommended Inspection Frequency

Do a Level II inspection each time a Level I inspection indicates one is required.

References

1. Sverdrup Corporation

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 9

COMPONENT: CONTROLS
CONTROL NUMBER: GS-II 06.05.04-9

Application

This guide applies to inspection of components located in the machine spaces under the moving walk.

Special Safety Requirements

1. The facility manager must provide personnel to stop the moving walk, remove the threshold plates, and to provide barricades for this part of the inspection.

2. Barricades must be provided at the ends of the moving walk while the threshold plates are removed.

3. The facility manager must provide personnel to replace the threshold plates, remove the barricades, and start the moving walk when the inspection is complete.

Inspection Items

Inspect all components and sub-components identified with the Level II Key No 9.

Recommended Inspection Frequency

Do a Level II inspection each time a Level I inspection indicates one is required.

References

1. Sverdrup Corporation

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 10

COMPONENT: CONTROLS
CONTROL NUMBER: GS-II 06.05.04-10

Application

This guide applies to the investigation of the inside of an enclosure, containing bare, energized, electrical parts.

Special Safety Requirements

The following list of special safety requirements, beyond the requirements listed in the Master Safety Plan and System Safety Section, are to be observed in the performance of this inspection.

1. The facility manager must provide personnel to stop the escalator, remove the threshold plates, and to provide barricade for this part of the inspection.

2. Barricades must be provided at the ends of the escalator while the threshold plates are removed.

3. This inspection guide applies to enclosures containing live electrical parts having a potential of 600 volts or less above ground. If the enclosure contains circuitry of higher potential, do not use this inspection guide.

4. Any enclosure that is padlocked for safety reasons is not to be opened unless okayed by the person having control of the key.

5. Inspector needs to carefully open, inspect the inside and close the enclosure without shutting down the equipment and without creating a hazard to himself.

6. The facility manager must provide personnel to replace the threshold plates, remove the barricades, and start the escalator when the inspection is complete.

Inspection Actions

1. Open panels or doors carefully as required for scanning those devices being tested.

2. Make temperature measurements with an infrared scanner.

3. Measure the ambient temperature by measuring a spot on the inside of the enclosure that is least effected by any internal panel heat source.

4. Measure the temperature of the device specified.

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 10 (Continued)

COMPONENT: CONTROLS
CONTROL NUMBER: GS-II 06.05.04-10

Inspection Actions (Continued)

5. Above ambient temperature is calculated by subtracting the ambient temperature from the device temperature.

6. Record the results.

7. Close panels or doors carefully after the inspection is complete.

Recommended Inspection Frequency

Do a Level II inspection each time a Level I inspection indicates one is required.

References

1. Maintenance Technology/September 1993; Write-up Title: "Infrared Keeps All Systems Go"

2. Raining - Agema Infrared Systems; "Measurement of Excess Temperatures with Infrared Scanners"

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 11

COMPONENT: CONTROLS
CONTROL NUMBER: GS-II 06.05.04-11

Application

This guide applies to the investigation of the inside of an enclosure, containing bare, energized, electrical parts.

Special Safety Requirements

The following list of special safety requirements, beyond the requirements listed in the Master Safety Plan and System Safety Section, are to be observed in the performance of this inspection.

1. The facility manager must provide personnel to stop the escalator, remove the threshold plates, and to provide barricade for this part of the inspection.

2. Barricades must be provided at the ends of the escalator while the threshold plates are removed.

3. This inspection guide applies to enclosures containing live electrical parts having a potential of 600 volts or less above ground. If the enclosure contains circuitry of higher potential, do not use this inspection guide.

4. Any enclosure that is padlocked for safety reason is not to be opened unless okayed by the person having control of the key.

5. Inspector needs to carefully open, inspect the inside and close the enclosure without shutting down the equipment, and without creating a hazard to himself.

6. The facility manager must provide personnel to replace the threshold plates, remove the barricades, and start the escalator when the inspection is complete.

Inspection Actions

1. Open panels or doors carefully as required for doing the visual inspection.

2. Visually inspect for those physical damaged defects that are listed and tagged Level II Key No. as indicated above.

3. Close panels or doors carefully after the inspection is completed.

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 11 (Continued)

COMPONENT: CONTROLS
CONTROL NUMBER: GS-II 06.05.04-11

Recommended Inspection Frequency

Do a Level II inspection each time a Level I inspection indicates one is required.

References

1. Sverdrup Corporation

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 1

COMPONENT: MOTOR AND DRIVE ASSEMBLY
CONTROL NUMBER: GS-III 06.05.02-1

Application

This guide applies to the investigation of an moving walk belt that is wobbly or sags during the ride.

Special Safety Requirements

1. The facility manager must provide personnel to stop the moving walk, remove the threshold plates, comb plates, and belt as necessary and to provide barricades for this part of the inspection.

2. Barricades must be provided at each end of the moving walk while the plates and belt are removed.

3. The facility manager must provide personnel to replace the plates and belt, remove the barricades, and start the moving walk when the inspection is complete.

Inspection Actions

1. Inspect belt for cracks, breaks, or other damage.

2. Inspect belt support rollers for damage.

3. Inspect roller mounting brackets for looseness.

Special Tools and Equipment

The following is a list of special tools required beyond those listed in the Standard Tool Section.

1. Screwdrivers
2. Socket wrenches
3. Feeler gauges
4. Special tools as recommended by the moving walk manufacturer.

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level I inspection.

References

1. Sverdrup Corporation

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 2

COMPONENT: MOTOR AND DRIVE ASSEMBLY
CONTROL NUMBER: GS-III 06.05.02-2

Application

This guide applies to the investigation of electrical motors having excessive noise or vibration symptoms.

Special Safety Requirements

1. The facility manager must provide personnel to stop the escalator, remove the threshold plates, and to provide barricades for this part of the inspection.

2. Barricades must be provided at the ends of the escalator while the threshold plates are removed.

3. The facility manager must provide personnel to replace the threshold plates, remove the barricades, and start the escalator when the inspection is complete.

Inspection Actions

1. Verify the findings of Level II inspection by using the vibration/sound level meter and measure the velocity (inches/second, peak), displacement (mils, peak-peak) and noise (db). Compare reading with acceptable manufacturer tolerances.

2. Inspect bearings for defects or dryness.

3. Inspect electrical motor and load unit for misalignment.

4. Inspect electrical motor and load unit for proper mounting.

5. Inspect electrical motor and load unit for transfer of vibration from another source.

6. Inspect coupling for loose connection.

7. If none of the above is the problem, reference manufacturer troubleshooting guide for additional inspections or repairs to be made.

Special Tools and Equipment

The following is a list of special tools required beyond those listed in the Standard Tool Section.

1. Vibration/sound level meter, IDR Mechanalysis #1TC87

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 2 (Continued)

COMPONENT: MOTOR AND DRIVE ASSEMBLY
CONTROL NUMBER: GS-III 06.05.02-2

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level II inspection.

References

1. KATO Engineering, Instruction Manual for Brushless Revolving Field Alternating Current Generators

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 3

COMPONENT: MOTOR AND DRIVE ASSEMBLY
CONTROL NUMBER: GS-III 06.05.02-3

Application

This guide applies to the investigation of excessive sparking at the collector rings, commutator or brushes.

Special Safety Requirements

1. The facility manager must provide personnel to stop the escalator, remove the threshold plates, and to provide barricade for this part of the inspection.
2. Barricades must be provided at the ends of the escalator while the threshold plates are removed.
3. The facility manager must provide personnel to replace the threshold plates, remove the barricades, and start the escalator when the inspection is complete.

Inspection Actions

Level II Inspector will detect excessive sparking in the area of either the collector rings, commutator or brushes. Level III Inspector will perform the following tasks.

1. Verify that there is excessive sparking in the area of either the collector rings, commutator or brushes.
2. If there is a problem, stop the motor and evaluate the problems causing the sparking.
3. Classify the severity of the problem and recommend the procedure needed to correct the problem.
4. If the Level III Inspector can not evaluate the problem, recommend the next procedure required to further identify the correction procedure that needs to be followed.

Special Tools and Equipment

The following is a list of special tools required beyond those listed in the Standard Tool Section.

1. Wrenches
2. Feelers

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 3 (Continued)

COMPONENT: MOTOR AND DRIVE ASSEMBLY
CONTROL NUMBER: GS-III 06.05.02-3

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level II inspection.

References

1. "Handbook of Building and Plant Maintenance, Forms and Checklists" by Roger W. Liska and Judith Morrison Liska

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 4

COMPONENT: MOTOR AND DRIVE ASSEMBLY
CONTROL NUMBER: GS-III 06.05.02-4

Application

This guide applies to the investigation of a hot terminal or device that is overheating from the flow of current through that terminal or device.

Special Safety Requirements

1. The facility manager must provide personnel to stop the escalator, remove the threshold plates, and to provide barricades for this part of the inspection.

2. Barricades must be provided at the ends of the escalator while the threshold plates are removed.

3. The facility manager must provide personnel to replace the threshold plates, remove the barricades, and start the escalator when the inspection is complete.

Inspection Actions

1. Verify the findings of Level II inspection by using the Infrared Scanner and measuring the temperatures of the device and terminals. If the device or terminals are not hot as indicated by the findings of Level II inspection, check the current flow through the device or terminals. Heat generated is proportionate to the square of the current. If there is little or no current flow through the device or terminal at the time of measurement, there will be no significant amount of heat generated.

2. For terminal connections, verify the type of conductor being terminated. If the conductor is an aluminum conductor, look for evidence of cold flow or melt down of conductor.

3. If there is evidence of cold flow or melt down of the aluminum conductor, the conductor should either be replaced or shortened and reconnected. When making new aluminum conductor terminations a joint compound should be used.

4. If the terminal is loose it should be tightened.

5. If none of the above is the problem than there is an internal problem and an on-site analysis must be made to determine if additional inspections are to be made or the unit is to be replaced.

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 4 (Continued)

COMPONENT: MOTOR AND DRIVE ASSEMBLY
CONTROL NUMBER: GS-III 06.05.02-4

Special Tools and Equipment

The following is a list of special tools required beyond those listed in the Standard Tool Section.

1. Infrared Scanner, Raytek, Inc., CAT #PM2EM-L2

2. Torque wrench

3. Digital Multimeter, Fluke #1TC676

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level II inspection.

References

1. Maintenance Technology/September 1993; Write-up Title: "Infrared Keeps All Systems Go"

2. Raining - Agema Infrared Systems; "Measurement of Excess Temperatures with Infrared Scanners"

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 5

COMPONENT: MOTOR AND DRIVE ASSEMBLY
CONTROL NUMBER: GS-III 06.05.02-5

Application

This guide applies to investigation of a gear reducer that vibrates or makes a loud or unusual noise during operation. The gear reducer is located in the machine space at the end of the moving walk.

Special Safety Requirements

The following is a list of special safety requirements beyond those listed in the Master Safety Plan and System Safety Section:

1. The facility manager must provide personnel to stop the moving walk, remove the threshold plates, comb plates, and steps as necessary and to provide barricades for this part of the inspection.

2. Barricades must be provided at each end of the moving walk while the plates and steps are removed.

3. The facility manager must provide personnel to replace the plates and steps, remove the barricades, and start the moving walk when the inspection is complete.

Inspection Actions

1. Verify the findings of the Level II inspection by using the vibration/sound level meter and measure the velocity (inches/second, peak), displacement (mils, peak-peak), and noise (dB). Compare reading with acceptable manufacturer tolerances.

2. Inspect motor, gear reducer, and load unit for transfer of vibration from another source.

3. Lock out the main power supply to the gear reducer.

4. Remove v-belt, drive chain, or otherwise disconnect the gear reducer output shaft from the load.

5. Check if any rotating parts are rubbing against stationary parts by hand rotation of the gear reducer input shaft and noting any excessive physical effort necessary to hand rotate the reducer, scraping noises, or varied resistance to rotation.

6. Disassemble the gear reducer and inspect for foreign matter within the casing.

7. Check for wear and damage to casing, gears, and worm.

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 5 (Continued)

COMPONENT: MOTOR AND DRIVE ASSEMBLY
CONTROL NUMBER: GS-III 06.05.02-5

Inspection Actions (Continued)

8. Worn bearings and coupling misalignment can cause the shaft to run off center. Check bearings for wear and, using the straight edge and feeler gauges or a dial indicator, check alignment of coupling halves.

9. Check shaft to determine if it is bent.

10. Inspect coupling for loose connection.

11. Check rotating elements to see if they are out of balance.

12. Check for excess grease or oil in bearing housing.

13. Check for lack of lubrication.

14. Check for improper installation of bearings.

15. Check for dirt or rust on bearings.

16. Check rigidity of motor and gear reducer mounting and base.

17. Inspect gear reducer in accordance with the manufacturer's Operation and Maintenance Manual.

18. Record the results.

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 5 (Continued)

COMPONENT: MOTOR AND DRIVE ASSEMBLY
CONTROL NUMBER: GS-III 06.05.02-5

Special Tools and Equipment

The following is a list of special tools and equipment, beyond the requirements listed in the Standard Tool Section.

1. Wrenches
2. Screwdrivers
3. Straightedge
4. Dial indicator
5. Vibration/sound level meter
6. Tapered thickness gauge or feeler gauges
7. Special tools as recommended by the equipment manufacturer.

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level II inspection.

References

1. KATO Engineering, Instruction Manual for Brushless Revolving Field Alternating Current Generators
2. Sverdrup Corporation

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 6

COMPONENT: CONTROLS
CONTROL NUMBER: GS-III 06.05.04-6

Application

This guide applies to the investigation of a hot terminal or device that is overheating from the flow of current through that terminal or device.

Special Safety Requirements

1. The facility manager must provide personnel to stop the escalator, remove the threshold plates, and to provide barricades for this part of the inspection.

2. Barricades must be provided at the ends of the escalator while the threshold plates are removed.

3. The facility manager must provide personnel to replace the threshold plates, remove the barricades, and start the escalator when the inspection is complete.

Inspection Actions

1. Verify the findings of Level II inspection by using the Infrared Scanner and measuring the temperatures of the device and terminals. If the device or terminals are not hot as indicated by the findings of Level II inspection, check the current flow through the device or terminals. Heat generated is proportionate to the square of the current. If there is little or no current flow through the device or terminal at the time of measurement, there will be no significant amount of heat generated.

2. For terminal connections, verify the type of conductor being terminated. If the conductor is an aluminum conductor, look for evidence of cold flow or melt down of conductor.

3. If there is evidence of cold flow or melt down of the aluminum conductor, the conductor should either be replaced or shortened and reconnected. When making new aluminum conductor terminations a joint compound should be used.

4. If the terminal is loose it should be tightened.

5. If none of the above is the problem than there is an internal problem and an on-site analysis must be made to determine if additional inspections are to be made or the unit is to be replaced.

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 6 (Continued)

COMPONENT: CONTROLS
CONTROL NUMBER: GS-III 06.05.04-6

Special Tools and Equipment

The following is a list of special tools required beyond those listed in the Standard Tool Section.

1. Infrared Scanner, Raytek, Inc., CAT #PM2EM-L2

2. Torque wrench

3. Digital Multimeter, Fluke #1TC676

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level II inspection.

References

1. Maintenance Technology/September 1993; Write-up Title: "Infrared Keeps All Systems Go"

2. Raining - Agema Infrared Systems; "Measurement of Excess Temperatures with Infrared Scanners"

06.06 CONVEYOR

DESCRIPTION

Conveyors are a sub-system of Building Conveying Systems. They are materials-handling machines designed to move individual objects or free-flowing bulk materials over a horizontal, inclined, declined, or vertical path of travel with continuous motion. A conveyor consists of a frame and supports, belt, drive assembly, and controls. The belt usually rides on a bed of free turning or driven rollers. In some cases the belt rides on a slide.

SPECIAL TOOL AND EQUIPMENT REQUIREMENT

No special tools are needed for the inspection of conveyors beyond those listed in the Standard Equipment Requirements section of the introduction.

SPECIAL SAFETY REQUIREMENTS

No special safety requirements are needed for the inspection of the conveyors, beyond the requirements listed in the Master Safety Plan and System Safety Section.

COMPONENT LIST

- 06.06.01 BELT
- 06.06.02 FRAME/SUPPORT STRUCTURE
- 06.06.03 SLIDE
- 06.06.04 GUIDE RAILS
- 06.06.05 ROLLERS, CARRYING/RETURN/SNUB
- 06.06.06 PULLEY, DRIVE/TAIL/TAKE-UP
- 06.06.07 TAKE-UP DEVICE
- 06.06.08 MOTOR/GEARMOTOR
- 06.06.09 SHEAVES AND V-BELTS
- 06.06.10 SPROCKETS AND CHAIN
- 06.06.11 HANGERS/BRACES/LEGS
- 06.06.12 CONTROLS

RELATED SUBSYSTEMS

Due to the related nature of the elements requiring inspection, the following systems and sub-systems should be reviewed for concurrent inspection.

02.01	STRUCTURAL FRAME
02.02	FLOOR FRAMING AND DECK
10.00	BUILDING ELECTRICAL
10.02	LOW VOLTAGE DIST. SYSTEM 600V OR LESS
29.00	SITE ELECTRICAL

06.06 CONVEYOR

STANDARD INSPECTION PROCEDURE

Conveyor inspection requires both Level I and Level II inspections as part of the basic inspection process. Additional Level II or Level III inspections may be indicated or "triggered" by Level I defect observations. Any additional Level II inspections should be accomplished by the inspector at the time of the Level I inspection. Associated defects and observations, for each major component of the conveyor, are listed in the inspector's Data Collection Device.

The conveyor will be inspected while it is running. Those items requiring inspection with the conveyor stopped are so noted.

COMPONENTS

◆ 06.06.01 BELT

The conveyor belt is a flexible fabric, rubber, or composition band used to carry objects or bulk materials. The belt is endless (by means of a splice) and may be of single or multiple ply construction. It may have a special coating or cover on one or both sides to protect it from the weather or the conveyed material or to provide friction with the pulleys or conveyed material.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Operation:**			
Observation:			
a. Belt operation is jerky or speed variable.	EA		
***{Severity M}			
b. Belt tracks to one side during operation.	EA		1
***{Severity M}			

Defect:

*** Physical Wear or Damage:**			
Stop the conveyor for this inspection.			
Observation:			
a. Belt is cut, torn, abraded, or damaged, carcass not showing.	EA		
***{Severity M}			
b. Belt splice broken, cracked, or otherwise damaged.	EA		
***{Severity H}			
c. Belt coating or cover is separated from or worn to the carcass.	SF		
***{Severity H}			
d. Belt is cut, torn, abraded, or damaged with carcass showing.	EA		
***{Severity H}			
e. Belt edge is cut, torn, or damaged with carcass showing.	SF		
***{Severity H}			

06.06 CONVEYOR

COMPONENTS (Continued)

◆ 06.06.02 FRAME/SUPPORT STRUCTURE

The conveyor frame or support structure is a rectangular, structural assembly designed to provide shape and strength for the conveyor. It is usually fabricated of welded or bolted steel shapes.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Corrosion:**			
Observation:			
a. Surface corrosion (no pitting evident). ***{Severity L}	SF		
b. Corrosion evidenced by pitting or blistering. ***{Severity M}	SF		
c. Corrosion evidenced by holes or loss of base metal. ***{Severity H}	SF		

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Connections:**			
Observation:			
a. Loose bolts or fasteners. ***{Severity L}	EA		
b. Broken or missing nuts, bolts, or rivets. ***{Severity M}	EA		
c. Cracked or broken weld. ***{Severity H}	EA		

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Physical Damage or Wear:**			
Observation:			
a. Frame or frame member out of alignment. ***{Severity H}	EA		
b. Frame member missing, cracked or bent. ***{Severity H}	EA		

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Paint:**			
Observation:			
a. Paint is worn; metal not showing. ***{Severity L}	SF		
b. Paint is worn; metal is showing. ***{Severity M}	SF		
c. Paint is scratched, chipped, flaking, chalked, or blistered. ***{Severity M}	SF		

06.06 CONVEYOR

COMPONENTS (Continued)

◆ 06.06.03 SLIDE

The conveyor slide is a flat, smooth surface the conveyor belt rides on at certain inclines and declines. The slide may be fabricated integral with the conveyor frame. It must be evaluated as an independent component.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Corrosion:**			
Stop the conveyor for this inspection.			
Observation:			
a. Surface corrosion (no pitting evident). ***{Severity L}	SF		
b. Corrosion evidenced by pitting or blistering. ***{Severity M}	SF		
c. Corrosion evidenced by holes or loss of base metal. ***{Severity H}	SF		

Defect:

*** Physical Damage or Wear:**			
Stop the conveyor for this inspection.			
Observation:			
a. Slide has minor wear. ***{Severity L}	EA		
b. Slide has noticeable wear. ***{Severity M}	EA		
c. Slide is out of alignment with other conveyor components. ***{Severity H}	EA		
d. Slide is cracked, dented, or bent. ***{Severity H}	EA		

Defect:

*** Paint:**			
Stop the conveyor for this inspection.			
Observation:			
a. Paint is worn; metal not showing. ***{Severity M}	SF		
b. Paint is worn; metal is showing. ***{Severity M}	SF		
c. Paint is scratched, chipped, flaking, chalked, or blistered. ***{Severity M}	SF		

06.06 CONVEYOR

COMPONENTS (Continued)

◆ 06.06.04 GUIDE RAILS

Guide rails are clips, brackets, bars, and plates designed and located to prevent objects falling off the conveyor bed. They are usually mounted on the side of the conveyor frame.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Corrosion:**			
Observation:			
a. Surface corrosion (no pitting evident). ***{Severity L}	SF		
b. Corrosion evidenced by pitting or blistering. ***{Severity M}	SF		
c. Corrosion evidenced by holes or loss of base metal. ***{Severity H}	SF		

Defect:

*** Connections:**			
Observation:			
a. Loose bolts or fasteners. ***{Severity L}	EA		
b. Broken or missing nuts, bolts, or rivets. ***{Severity M}	EA		
c. Cracked or broken weld. ***{Severity H}	EA		

Defect:

*** Physical Damage or Wear:**			
Observation:			
a. Guide rail has minor wear. ***{Severity L}	EA		
b. Guide rail has noticeable wear. ***{Severity M}	EA		
c. Guide rail is out of alignment. ***{Severity H}	EA		
d. Guide rail or support is missing, cracked or bent. ***{Severity H}	EA		

06.06 CONVEYOR

COMPONENTS (Continued)

◆ 06.06.04 GUIDE RAILS (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
* **Paint:**			
Observation:			
a. Paint is worn; metal not showing. ***{Severity L}	SF		
b. Paint is worn; metal is showing. ***{Severity M}	SF		
c. Paint is scratched, chipped, flaking, chalked, or blistered. ***{Severity M}	SF		

06.06 CONVEYOR

COMPONENTS (Continued)

◆ 06.06.05 ROLLERS, CARRYING/RETURN/SNUB

A roller or idler is a round rotating cylinder that carries the conveyor belt. Rollers are usually made of formed sheet metal and have a concentric shaft with internal permanently lubricated bearings. Carrying rollers support the belt in the area where the load is carried. The ends of the carrying roller shaft may be supported by brackets attached to the conveyor frame or by the frame itself. Return rollers carry the belt on its return run from the head end to the tail end of the conveyor. Snub rollers are rollers used to increase the arc of contact between the belt and the drive, tail, or take-up pulley. Carrying rollers in the loading or impact area may be covered with or made of a resilient material to cushion the impact of loading.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Corrosion:**			
Stop the conveyor for this inspection.			
Observation:			
a. Surface corrosion (no pitting evident).	SF		
***{Severity L}			
b. Corrosion evidenced by pitting or blistering.	SF		
***{Severity M}			
c. Corrosion evidenced by holes or loss of base metal.	SF		
***{Severity H}			

Defect:

	UOM		
*** Physical Damage or Wear:**			
Stop the conveyor for this inspection.			
Observation:			
a. Roller surface is dented or worn.	EA		
***{Severity L}			
b. Roller makes loud or unusual noise.	EA		
***{Severity M}			
c. Roller shaft has excess play within bearing.	EA		
***{Severity M}			
d. Roller is out of alignment with rest of conveyor components.	EA		
***{Severity M}			
e. Roller coating is missing or damaged.	EA		
***{Severity M}			
f. Roller does not rotate.	EA		
***{Severity H}			
g. Roller is cracked or bent.	EA		
***{Severity H}			

06.06 CONVEYOR

COMPONENTS (Continued)

◆ 06.06.05 ROLLERS, CARRYING/RETURN/SNUB (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Paint:**			
Stop the conveyor for this inspection.			
Observation:			
a. Paint is worn; metal not showing.	SF		
***{Severity L}			
b. Paint is worn; metal is showing.	SF		
***{Severity M}			
c. Paint is scratched, chipped, flaking, chalked, or blistered.	SF		
***{Severity M}			

06.06 CONVEYOR

COMPONENTS (Continued)

◆ 06.06.06 PULLEYS, DRIVE/TAIL/TAKE-UP

A pulley is a round rotating wheel used to transmit energy or force to or change the direction of a belt. Pulleys are usually made of formed sheet metal and are mounted on a concentric shaft with external bearings. Pulleys may have a crowned face for centering the belt on the pulley. Pulleys may be covered or coated with a resilient material to reduce wear on the pulley face, effect a self-cleaning action on the pulley surface, or increase the coefficient of friction between the belt and pulley. The drive pulley transmits energy or force to the belt. The tail pulley changes the direction of the belt at the loading or input end of the belt. The take-up pulley (which may be the tail pulley) is used to adjust tension on the belt.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Corrosion:**			
Stop the conveyor for this inspection.			
Observation:			
a. Surface corrosion (no pitting evident).	SF		
***{Severity L}			
b. Corrosion evidenced by pitting or blistering.	SF		
***{Severity M}			
c. Corrosion evidenced by holes or loss of base metal.	SF		
***{Severity H}			

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Physical Damage or Wear:**			
Stop the conveyor for this inspection.			
Observation:			
a. Pulley surface is dented or worn.	EA		
***{Severity L}			
b. Pulley makes loud or unusual noise.	EA		
***{Severity M}			
c. Pulley is out of alignment with rest of conveyor components.	EA		
***{Severity M}			
d. Pulley coating is missing or damaged.	EA		
***{Severity M}			
e. Pulley shaft has excess play within bearing.	EA		2
***{Severity M}			
f. Pulley does not rotate.	EA		
***{Severity H}			
g. Pulley is cracked or bent.	EA		
***{Severity H}			
h. Pulley bearing is not lubricated.	EA		
***{Severity H}			

06.06 CONVEYOR

COMPONENTS (Continued)

◆ 06.06.06 PULLEYS, DRIVE/TAIL/TAKE-UP (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Paint:**			
Stop the conveyor for this inspection.			
Observation:			
a. Paint is worn; metal not showing. ***{Severity L}	SF		
b. Paint is worn; metal is showing. ***{Severity M}	SF		
c. Paint is scratched, chipped, flaking, chalked, or blistered. ***{Severity M}	SF		

06.06 CONVEYOR

COMPONENTS (Continued)

◆ 06.06.07 TAKE-UP DEVICE

The take-up device is a mechanical device that uses an adjustable pulley mounting to compensate for changes in belt length due to wear, climatic conditions, stretch, planned excess length, etc. The take-up device may make use of the tail pulley or another pulley provided specifically for take-up duty. The take-up device may be manual, usually screw type, or automatic with power provided by springs, gravity, or hydraulic, electric, or pneumatic means.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Corrosion:**			
Observation:			
a. Surface corrosion (no pitting evident). ***{Severity L}	SF		
b. Corrosion evidenced by pitting or blistering. ***{Severity M}	SF		
c. Corrosion evidenced by holes or loss of base metal. ***{Severity H}	SF		

Defect:

*** Connections:**			
Observation:			
a. Loose bolts or fasteners. ***{Severity L}	EA		
b. Broken or missing nuts, bolts, or rivets. ***{Severity M}	EA		
c. Cracked or broken weld. ***{Severity H}	EA		

Defect:

*** Physical Damage or Wear:**			
Observation:			
a. Take-up device member has minor wear. ***{Severity L}	EA		
b. Take-up device member has noticeable wear. ***{Severity M}	EA		
c. Take-up device does not operate. ***{Severity H}	EA		3
d. Take-up device or member out of alignment. ***{Severity H}	EA		
e. Take-up device member missing, cracked or bent. ***{Severity H}	EA		

06.06 CONVEYOR

COMPONENTS (Continued)

◆ 06.06.07 TAKE-UP DEVICE (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Paint:**			
Observation:			
a. Paint is worn; metal not showing.	SF		
***{Severity L}			
b. Paint is worn; metal is showing.	SF		
***{Severity M}			
c. Paint is scratched, chipped, flaking, chalked, or blistered.	SF		
***{Severity M}			

06.06 CONVEYOR

COMPONENTS (Continued)

◆ 06.06.08 MOTOR/GEARMOTOR

The conveyor is driven by an electrical motor or gearmotor. The gear reducer housing may or may not be an integral part of the motor.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Corrosion:**			
Observation:			
a. Surface corrosion (no pitting evident). ***{Severity L}	SF		
b. Corrosion evidenced by pitting or blistering. ***{Severity M}	SF		
c. Corrosion evidenced by holes or loss of base metal. ***{Severity H}	SF		

Defect:

*** Housekeeping:**
Observation:

a. Machine air passage dirty or clogged. ***{Severity M}	EA		
b. Motor housings contaminated. ***{Severity L}	EA		

Defect:

*** Structure:**
Observation:

a. Motor frame cracked or broken. ***{Severity M}	EA		
b. Motor support cracked or broken. ***{Severity M}	EA		
c. Motor support shifted. ***{Severity M}	EA		
d. Defective mounting pads. ***{Severity M}	EA		
e. Loose or missing mounting bolts. ***{Severity H}	EA		

06.06 CONVEYOR

COMPONENTS (Continued)

◆ **06.06.08 MOTOR/GEARMOTOR (Continued)**

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Motor Operation:**			
Observation:			
a. Excessively noisy. ***{Severity M }	EA		4
b. Excessive vibration. ***{Severity M}	EA		4
c. Excessive sparking at the collector rings, commutator, or brushes. ***{Severity M}	EA		5

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Power Connections:**			
Observation:			
a. Terminal box cover missing. ***{Severity L}	EA		
b. Insulation of motor leads damaged or deteriorated. ***{Severity M}	EA	1	
c. Taping improperly installed or deteriorated. ***{Severity M}	EA	1	
d. Unit not grounded. ***{Severity H}	EA	1	

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Hot Spots:**			
Observation:			
a. Terminal 5° to 24° C above ambient. ***{Severity M}	EA	2	6
b. Terminal 25°C or more above ambient. ***{Severity H}	EA	2	6

06.06 CONVEYOR

COMPONENTS (Continued)

◆ **06.06.08 MOTOR/GEARMOTOR (Continued)**

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Gear Reducer:**			
Stop the conveyor for this inspection item "I".			
Observation:			
a. Gear reducer housing has surface rust, no pitting evident.	SF		
***{Severity L}			
b. Oil dipstick missing or damaged.	EA		
***{Severity L}			
c. Gear reducer corrosion with pitting and blistering of base metal.	SF		
***{Severity M}			
d. Gear reducer housing cracked, dented, or otherwise damaged.	EA		
***{Severity M}			
e. Oil leak with oil wetting gear reducer housing surfaces.	EA		
***{Severity M}			
f. Gear Reducer corrosion with loss of base metal.	EA		
***{Severity H}			
g. Oil lubrication connection missing or damaged.	EA		
***{Severity H}			
h. Oil leak with oil pooling below gear reducer.	EA		
***{Severity H}			
i. Damaged, loose, or missing nuts, bolts, or fasteners.	EA		
***{Severity H}			
j. Loose or damaged coupling.	EA		
***{Severity H}			

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
***Gear Reducer Operation:**			
Observation:			
a. Output rotation speed is irregular.	EA		7
***{Severity M}			
b. Unit vibrates or makes loud or unusual noise during operation.	EA		8
***{Severity H}			

06.06 CONVEYOR

COMPONENTS (Continued)

◆ 06.06.09 SHEAVES AND V-BELTS

Sheaves and v-belts are a means of transferring energy or force from the motor/gearmotor to the conveyor drive pulley.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Sheaves:**			
Stop the conveyor for this inspection.			
Observation:			
a. Sheave is loose or not square with shaft.	EA		
***{Severity M}			
b. Sheave is worn with noticeable loss of base metal.	EA		
***{Severity M}			
c. Sheave is bent, cracked or broken.	EA		
***{Severity H}			

Defect:

Defect	UOM	LEVEL II KEY	LEVEL III KEY
*** V-Belt:**			
Stop the conveyor for this inspection.			
Observation:			
a. Belt is cracked, cut, torn, abraded, or otherwise damaged.	EA		
***{Severity M}			
b. V-belt loose; depresses 1/2-inch or more under finger pressure.	EA		
***{Severity M}			
c. Coating or cover is worn to extent carcass is showing.	EA		
***{Severity H}			

06.06 CONVEYOR

COMPONENTS (Continued)

◆ 06.06.10 SPROCKETS AND CHAIN

Sprockets and drive chain are a means of transferring energy or force from the motor/gearmotor to the drive pulley.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Sprockets:**			
Stop the conveyor for this inspection.			
Observation:			
a. Sprocket is loose or not square with shaft.	EA		
***{Severity M}			
b. Sprocket teeth worn with distortion of tooth shape.	EA		
***{Severity M}			
c. Sprocket teeth cracked or broken.	EA		
***{Severity H}			

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Chain:**			
Stop the conveyor for this inspection.			
Observation:			
a. Chain parts worn with distortion of part shape.	EA		
***{Severity M}			
b. Drive chain parts cracked or broken.	EA		
***{Severity H}			
c. Oil lubrication system damaged or not working.	EA		
***{Severity H}			

06.06 CONVEYOR

COMPONENTS (Continued)

◆ 06.06.11 HANGERS/BRACES/LEGS

Conveyors may be supported on legs from the floor or by hangers from the overhead building structure. Hangers, braces, and legs are usually fabricated of welded or bolted steel shapes. Supports for some conveyor system sections or components may make use of vibration isolation cushions or other vibration absorbing devices to prevent transmission of vibration and noise from the conveyor to the building structure.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Corrosion:**			
Observation:			
a. Surface corrosion (no pitting evident).	SF		
***{Severity L}			
b. Corrosion evidenced by pitting or blistering.	SF		
***{Severity M}			
c. Corrosion evidenced by holes or loss of base metal.	SF		
***{Severity H}			

Defect:

*** Connections:**			
Observation:			
a. Loose bolts or fasteners.	EA		
***{Severity L}			
b. Broken or missing nuts, bolts, or rivets.	EA		
***{Severity M}			
c. Cracked or broken weld.	EA		
***{Severity H}			

Defect:

*** Physical Damage or Wear:**			
Observation:			
a. Support misaligned.	EA		
***{Severity H}			
b. Support missing.	EA		
***{Severity H}			
c. Support or support member is bent or out of alignment.	EA		
***{Severity H}			
d. Support member missing, cracked or broken.	EA		
***{Severity H}			

06.06 CONVEYOR

COMPONENTS (Continued)

◆ **06.06.11 HANGERS/BRACES/LEGS (Continued)**

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
* **Paint:**			
Observation:			
a. Paint is worn; metal not showing.	SF		
***{Severity L}			
b. Paint is worn; metal is showing.	SF		
***{Severity M}			
c. Paint is scratched, chipped, flaked, chalked or blistered.	SF		
***{Severity M}			

06.06 CONVEYOR

COMPONENTS (Continued)

◆ 06.06.12 CONTROLS

Conveyor controls provide for the automatic and safe operation of the unit. An emergency stop control station will be located on or at a readily accessible location near conveyor. The emergency stop control station will have pushbuttons or switches for emergency control of the unit and may be equipped with pilot lights. The control panel, housing the overall monitoring and control of the conveyor may be located near the unit or in a central control area. The control panel consists of pilot lights, meters, audible alarms, etc. to monitor the conveyor and pushbuttons, switches, relays, microprocessor, etc. to control the conveyor.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Corrosion - Control Station:**			
Observation:			
a. Surface corrosion (no pitting evident).	SF		
***{Severity L}			
b. Corrosion evidenced by pitting or blistering.	SF		
***{Severity M}			
c. Corrosion evidenced by holes or loss of base metal.	SF		
***{Severity H}			

Defect:

*** Physical Damage - Control Station:**			
Observation:			
a. Loose enclosure mounting.	EA		
***{Severity L}			
b. Indicating lamp inoperable.	EA		
***{Severity L}			
c. Indicating lens broken or missing.	EA		
***{Severity L}			
d. Enclosure damaged (cannot be sealed).	EA		
***{Severity M}			
e. Unused opening not covered.	EA		
***{Severity M}			
f. Pushbutton broken or missing.	EA		
***{Severity M}			
g. Selector switch broken or missing.	EA		
***{Severity M}			
h. Security devices missing or inoperable.	EA		
***{Severity H}			

06.06 CONVEYOR

COMPONENTS (Continued)

◆ 06.06.12 CONTROLS (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Corrosion - Control Panel:**			
Observation:			
a. Surface corrosion (no pitting evident). ***{Severity L}	SF		
b. Corrosion evidenced by pitting or blistering. ***{Severity M}	SF		
c. Corrosion evidenced by holes or loss of base metal. ***{Severity H}	SF		

Defect:

*** Physical Damage - Control Panel:**			
Observation:			
a. Loose enclosure mounting or panel fastener loose, broken or missing. ***{Severity L}	EA		
b. Switch/pushbutton or indicator light damaged or missing. ***{Severity M}	EA		
c. Indicating lens broken or missing. ***{Severity L}	EA		
d. Enclosure damaged (cannot be sealed). ***{Severity M}	EA		
e. Unused opening not covered. ***{Severity M}	EA		
f. Transformer discolored or blistered due to overheating. ***{Severity M}	EA	4	
g. Security devices missing or inoperable. ***{Severity H}	EA		
h. Door handle bent or inoperable. ***{Severity H}	EA		

Defect:

*** Hot Spots - Control Panel:**			
Observation:			
a Control transformer 5° to 24°C above ambient. ***{Severity M}	EA	3	9
b. Control transformer 25°C or more above ambient. ***{Severity H}	EA	3	9

06.06 CONVEYOR

REFERENCES

1. Belt Conveyors for Bulk Materials, Second Edition, Conveyor Equipment Manufacturers Association

2. Conveyor Terms and Definitions, ANSI/CEMA No. 102-1988, Conveyor Equipment Manufacturers Association

3. Conveyor Performance Terminology, CEMA Standard No. 705, Conveyor Equipment Manufacturers Association

4. Occupational Safety and Health Standards for General Industry, Occupational Safety and Health Administration, United States Department of Labor

5. Maintenance Technology/September 1993; Write-Up Title: "Infrared Keeps All Systems Go"

6. Raining - Agema Infrared Systems; "Measurement of Excess Temperatures with Infrared Scanners"

7. KATO Engineering, "Instruction Manual for Brushless Revolving Field Alternating Current Generators"

8. Marks' Standard Handbook for Mechanical Engineers, Eugene A. Avallone and Theodore Baumeister I, Ninth Edition, McGraw-Hill Book Company

9. "Handbook of Building and Plant Maintenance, Forms and Checklists" By Roger W. Liska and Judith Morrison Liska

10. R.S. Means Estimating Data, 1994

11. Sverdrup Corporation

06.06 CONVEYOR

LEVEL II KEY	GUIDE SHEET CONTROL NUMBER
1	GS-II 06.06.08-1
2	GS-II 06.06.08-2
3	GS-II 06.06.12-3
4	GS-II 06.06.12-4

LEVEL III KEY	GUIDE SHEET CONTROL NUMBER
1	GS-III 06.06.01-1
2	GS-III 06.06.06-2
3	GS-III 06.06.07-3
4	GS-III 06.06.08-4
5	GS-III 06.06.08-5
6	GS-III 06.06.08-6
7	GS-III 06.06.08-7
8	GS-III 06.06.08-8
9	GS-III 06.06.12-9

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 1

COMPONENT: MOTOR/GEARMOTOR
CONTROL NUMBER: GS-II 06.06.08-1

Application

This guide applies to the investigation of the inside of an enclosure, containing bare, energized, electrical parts.

Special Safety Requirements

The following list of special safety requirements, beyond the requirements listed in the Master Safety Plan and System Safety Section, are to be observed in the performance of this inspection.

1. This inspection guide applies to enclosures containing live electrical parts having a potential of 600 volts or less above ground. If the enclosure contains circuitry of higher potential, do not use this inspection guide.

2. Any enclosure that is padlocked for safety reason is not to be opened unless okayed by the person having control of the key.

3. Inspector needs to carefully open, inspect the inside and close the enclosure without shutting down the equipment, and without creating a hazard to himself.

Inspection Actions

1. Open panels or doors carefully as required for doing the visual inspection.

2. Visually inspect for those physical damaged defects that are listed and tagged Level II Key No. as indicated above.

3. Close panels or doors carefully after the inspection is completed.

Recommended Inspection Frequency

Do a Level II inspection each time a Level I inspection indicates one is required.

References

1. Sverdrup Corporation

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 2

COMPONENT: MOTOR/GEARMOTOR
CONTROL NUMBER: GS-II 06.06.08-2

Application

This guide applies to the investigation of the inside of an enclosure, containing bare, energized, electrical parts.

Special Safety Requirements

The following list of special safety requirements, beyond the requirements listed in the Master Safety Plan and System Safety Section, are to be observed in the performance of this inspection.

1. This inspection guide applies to enclosures containing live electrical parts having a potential of 600 volts or less above ground. If the enclosure contains circuitry of higher potential, do not use this inspection guide.
2. Any enclosure that is padlocked for safety reason is not to be opened unless okayed by the person having control of the key.
3. Inspector needs to carefully open, inspect the inside and close the enclosure without shutting down the equipment, and without creating a hazard to himself.

Inspection Actions

1. Open panels or doors carefully and to the degree required for scanning those devices being tested.
2. Make temperature measurements with an infrared scanner.
3. Measure the ambient temperature by measuring a spot on the inside of the enclosure that is least effected by any internal panel heat source.
4. Measure the temperature of the device specified.
5. Above-ambient temperature is calculated by subtracting the ambient temperature from the device temperature.
6. Record the results.
7. Close panels or doors carefully after the inspection is complete.

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 2 (Continued)

COMPONENT: MOTOR/GEARMOTOR
CONTROL NUMBER: GS-II 06.06.08-2

Recommended Inspection Frequency

Do a Level II inspection each time a Level I inspection is made.

References

1. Maintenance Technology/September 1993; Write-up Title: *"Infrared Keeps All Systems Go"*

2. Raining - Agema Infrared Systems; *"Measurement of Excess Temperatures with Infrared Scanners"*

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 3

COMPONENT: CONTROLS
CONTROL NUMBER: GS-II 06.06.12-3

Application

This guide applies to the investigation of the inside of an enclosure, containing bare, energized, electrical parts.

Special Safety Requirements

The following list of special safety requirements, beyond the requirements listed in the Master Safety Plan and System Safety Section, are to be observed in the performance of this inspection.

1. This inspection guide applies to enclosures containing live electrical parts having a potential of 600 volts or less above ground. If the enclosure contains circuitry of higher potential, do not use this inspection guide.

2. Any enclosure that is padlocked for safety reason is not to be opened unless okayed by the person having control of the key.

3. Inspector needs to carefully open, inspect the inside and close the enclosure without shutting down the equipment, and without creating a hazard to himself.

Inspection Actions

1. Open panels or doors carefully and to the degree required for scanning those devices being tested.

2. Make temperature measurements with an infrared scanner.

3. Measure the ambient temperature by measuring a spot on the inside of the enclosure that is least effected by any internal panel heat source.

4. Measure the temperature of the device specified.

5. Above-ambient temperature is calculated by subtracting the ambient temperature from the device temperature.

6. Record the results.

7. Close panels or doors carefully after the inspection is complete.

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 3 (Continued)

COMPONENT: CONTROLS
CONTROL NUMBER: GS-II 06.06.12-3

Recommended Inspection Frequency

Do a Level II inspection each time a Level I inspection is made.

References

1. Maintenance Technology/September 1993; Write-up Title: *"Infrared Keeps All Systems Go"*

2. Raining - Agema Infrared Systems; *"Measurement of Excess Temperatures with Infrared Scanners"*

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 4

COMPONENT: CONTROLS
CONTROL NUMBER: GS-II 06.06.12-4

Application

This guide applies to the investigation of the inside of an enclosure, containing bare, energized, electrical parts.

Special Safety Requirements

The following list of special safety requirements, beyond the requirements listed in the Master Safety Plan and System Safety Section, are to be observed in the performance of this inspection.

1. This inspection guide applies to enclosures containing live electrical parts having a potential of 600 volts or less above ground. If the enclosure contains circuitry of higher potential, do not use this inspection guide.
2. Any enclosure that is padlocked for safety reason is not to be opened unless okayed by the person having control of the key.
3. Inspector needs to carefully open, inspect the inside and close the enclosure without shutting down the equipment, and without creating a hazard to himself.

Inspection Actions

1. Open panels or doors carefully as required for doing the visual inspection.
2. Visually inspect for those physical damaged defects that are listed and tagged Level II Key No. as indicated above.
3. Close panels or doors carefully after the inspection is completed.

Recommended Inspection Frequency

Do a Level II inspection each time a Level I inspection indicates one is required.

References

1. Sverdrup Corporation

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 1

COMPONENT: BELT
CONTROL NUMBER: GS-III 06.06.01-1

Application

This guide applies to investigation of a conveyor belt that tracks to one side during operation..

Special Safety Requirements

The following is a list of special safety requirements beyond those listed in the Master Safety Plan and System Safety Section:

1. Notify affected personnel and obtain permission to take the unit out of service.

Inspection Items

1. Inspect belt tension for proper adjustment.
2. Inspect tail pulley for proper alignment.
3. Inspect head pulley and tail pulley for loose hub.
4. Inspect belt for evidence of uneven stretching.
5. Inspect conveyor belt and associated components in accordance with the Manufacturer's Operation and Maintenance Manual.
6. Record the results.

Special Tools and Equipment

The following is a list of special tools and equipment, beyond the requirements listed in the Standard Tool Section.

1. Wrenches
2. Screwdrivers
3. Special tools as recommended by the equipment manufacturer.

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level I inspection.

References

1. Belt Conveyors for Bulk Materials, Second Edition, Conveyor Equipment Manufacturers Association
2. Marks' Standard Handbook for Mechanical Engineers, Eugene A. Avallone and Theodore Baumeister I, Ninth Edition, McGraw-Hill Book Company

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 2

COMPONENT: PULLEYS, DRIVE/TAIL/TAKE-UP
CONTROL NUMBER: GS-III 06.06.06-2

Application

This guide applies to investigation of a pulley shaft with excess play within the bearing.

Special Safety Requirements

The following is a list of special safety requirements beyond those listed in the Master Safety Plan and System Safety Section:

1. Notify affected personnel and obtain permission to take the unit out of service.

Inspection Items

1. Inspect bearing for worn or damaged inner or outer bearing ring.
2. Inspect bearing for worn balls, rollers, or other bearing surfaces.
3. Inspect bearing for worn or damaged retainer or cage.
4. Inspect shaft for wear or damage.
5. Inspect shaft and bearing in accordance with the Manufacturer's Operation and Maintenance Manual.
6. Record the results.

Special Tools and Equipment

The following is a list of special tools and equipment, beyond the requirements listed in the Standard Tool Section.

1. Wrenches
2. Screwdrivers
3. Special tools as recommended by the equipment manufacturer.

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level I inspection.

References

1. Marks' Standard Handbook for Mechanical Engineers, Eugene A. Avallone and Theodore Baumeister I, Ninth Edition, McGraw-Hill Book Company

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 3

COMPONENT: TAKE-UP DEVICE
CONTROL NUMBER: GS-III 06.06.07-3

Application

This guide applies to investigation of a take-up device that does not operate.

Special Safety Requirements

The following is a list of special safety requirements beyond those listed in the Master Safety Plan and System Safety Section:

1. Notify affected personnel and obtain permission to take the unit out of service.

Inspection Items

1. Inspect take-up device for severely worn or damaged parts.
2. Inspect device for broken parts.
3. Inspect device for improper adjustment or setting.
4. Inspect gravity type device for external interference with counterweights or cables.
5. Inspect for interruption in power supply to power operated take-up device.
6. Inspect for control anomaly in automatic take-up systems.
7. Inspect take-up device in accordance with the conveyor Manufacturer's Operation and Maintenance Manual.
8. Record the results.

Special Tools and Equipment

The following is a list of special tools and equipment, beyond the requirements listed in the Standard Tool Section.

1. Wrenches
2. Screwdrivers
3. Special tools as recommended by the equipment manufacturer.

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 3 (Continued)

COMPONENT: TAKE-UP DEVICE
CONTROL NUMBER: GS-III 06.06.07-3

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level I inspection.

References

1. Sverdrup Corporation

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 4

COMPONENT: MOTOR/GEARMOTOR
CONTROL NUMBER: GS-III 06.06.08-4

Application

This guide applies to the investigation of electrical motors having excessive noise or vibration symptoms.

Special Safety Requirements

No special safety requirements are needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section.

Inspection Actions

1. Verify the findings of Level I inspection by using the vibration/sound level meter and measure the velocity (inches/second, peak), displacement (mils, peak-peak) and noise (db). Compare reading with acceptable manufacturer tolerances.
2. Inspect bearings for defects or dryness.
3. Inspect electrical motor and load unit for misalignment.
4. Inspect electrical motor and load unit for proper mounting.
5. Inspect electrical motor and load unit for transfer of vibration from another source.
6. Inspect coupling for loose connection.
7. If none of the above is the problem, reference manufacturer troubleshooting guide for additional inspections or repairs to be made.

Special Tools and Equipment

The following is a list of special tools required beyond those listed in the Standard Tool Section.

1. Vibration/sound level meter, IDR Mechanalysis #1TC87

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level I inspection.

References

1. KATO Engineering, Instruction Manual for Brushless Revolving Field Alternating Current Generators

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 5

COMPONENT: MOTOR/GEARMOTOR
CONTROL NUMBER: GS-III 06.06.08-5

Application

This guide applies to the investigation of excessive sparking at the collector rings, commutator or brushes.

Special Safety Requirements

No special safety requirements are needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section.

Inspection Actions

Level I Inspector will detect excessive sparking in the area of either the collector rings, commutator or brushes. Level III Inspector will perform the following tasks.

1. Verify that there is excessive sparking in the area of either the collector rings, commutator or brushes.

2. If there is a problem, stop the motor and evaluate the problems causing the sparking.

3. Classify the severity of the problem and recommend the procedure needed to correct the problem.

4. If the Level III Inspector can not evaluate the problem, recommend the next procedure required to further identify the correction procedure that needs to be followed.

Special Tools and Equipment

The following is a list of special tools required beyond those listed in the Standard Tool Section.

1. Wrenches

2. Feelers

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level I inspection.

References

1. *"Handbook of Building and Plant Maintenance, Forms and Checklists"* by Roger W. Liska and Judith Morrison Liska

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 6

COMPONENT: MOTOR/GEARMOTOR
CONTROL NUMBER: GS-III 06.06.08-6

Application

This guide applies to the investigation of a hot terminal or device that is overheating from the flow of current through that terminal or device.

Special Safety Requirements

No special safety requirements are needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section.

Inspection Actions

1. Verify the findings of Level II inspection by using the Infrared Scanner and measuring the temperatures of the device and terminals. If the device or terminals are not hot as indicated by the findings of Level II inspection, check the current flow through the device or terminals. Heat generated is proportionate to the square of the current. If there is little or no current flow through the device or terminal at the time of measurement, there will be no significant amount of heat generated.

2. For terminal connections, verify the type of conductor being terminated. If the conductor is an aluminum conductor, look for evidence of cold flow or melt down of conductor.

3. If there is evidence of cold flow or melt down of the aluminum conductor, the conductor should either be replaced or shortened and reconnected. When making new aluminum conductor terminations a joint compound should be used.

4. If the terminal is loose it should be tightened. De-energize prior to attempting tightening of terminal connections.

5. If none of the above is the problem than there is an internal problem and an on-site analysis must be made to determine if additional inspections are to be made or the unit is to be replaced.

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 6 (Continued)

COMPONENT: MOTOR/GEARMOTOR
CONTROL NUMBER: GS-III 06.06.08-6

Special Tools and Equipment

The following is a list of special tools required beyond those listed in the Standard Tool Section.

1. Infrared Scanner, Raytek, Inc., #PM2EM-L2

2. Torque wrench

3. Digital Multimeter, Fluke #1TC676

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level II inspection.

References

1. Maintenance Technology/September 1993; Write-up Title: *"Infrared Keeps All Systems Go"*

2. Raining - Agema Infrared Systems; *"Measurement of Excess Temperatures with Infrared Scanners"*

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 7

COMPONENT: MOTOR/GEARMOTOR
CONTROL NUMBER: GS-III 06.06.08-7

Application

This guide applies to investigation of a gear reducer with irregular output rotation speed.

Special Safety Requirements

The following is a list of special safety requirements beyond those listed in the Master Safety Plan and System Safety Section:

1. Notify affected personnel and obtain permission to take the unit out of service.

Inspection Items

1. Verify the findings of the Level I inspection by using the tachometer to measure the rotation speed (RPM) of motor and gear reducer output shaft. Compare reading with acceptable manufacturer tolerances.
2. Lock out the main power supply to the gear reducer.
3. Remove v-belt, drive chain, or otherwise disconnect the gear reducer output shaft from the conveyor.
4. Check if any rotating parts are rubbing against stationary parts by hand rotation of the gear reducer input shaft and noting any excessive physical effort necessary to hand rotate the reducer, scraping noises, or varied resistance to rotation.
5. Disassemble the gear reducer and inspect for foreign matter within the casing.
6. Check for wear and damage to casing, gears, and worm.
7. Inspect coupling for loose connection.
8. Inspect gear reducer in accordance with the Manufacturer's Operation and Maintenance Manual.
9. Record the results.

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 7 (Continued)

COMPONENT: MOTOR/GEARMOTOR
CONTROL NUMBER: GS-III 06.06.08-7

Special Tools and Equipment

The following is a list of special tools and equipment, beyond the requirements listed in the Standard Tool Section.

1. Wrenches

2. Screwdrivers

3. Tachometer

4. Special tools as recommended by the equipment manufacturer.

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level I inspection.

References

1. Sverdrup Corporation

2. KATO Engineering, "Instruction Manual for Brushless Revolving Field Alternating Current Generators"

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 8

COMPONENT: MOTOR/GEARMOTOR
CONTROL NUMBER: GS-III 06.06.08-8

Application

This guide applies to investigation of a gear reducer that vibrates or makes a loud or unusual noise during operation.

Special Safety Requirements

The following is a list of special safety requirements beyond those listed in the Master Safety Plan and System Safety Section:

1. Notify affected personnel and obtain permission to take the unit out of service.

Inspection Items

1. Verify the findings of the Level I inspection by using the vibration/sound level meter and measure the velocity (inches/second, peak), displacement (mils, peak-peak), and noise (dB). Compare reading with acceptable manufacturer tolerances.

2. Inspect motor, gear reducer, and load unit for transfer of vibration from another source.

3. Lock out the main power supply to the gear reducer.

4. Remove v-belt, drive chain, or otherwise disconnect the gear reducer output shaft from the conveyor.

5. Check if any rotating parts are rubbing against stationary parts by hand rotation of the gear reducer input shaft and noting any excessive physical effort necessary to hand rotate the reducer, scraping noises, or varied resistance to rotation.

6. Disassemble the gear reducer and inspect for foreign matter within the casing.

7. Check for wear and damage to casing, gears, and worm.

8. Worn bearings and coupling misalignment can cause the shaft to run off center. Check bearings for wear and, using the straight edge and feeler gauges or a dial indicator, check alignment of coupling halves.

9. Check shaft to determine if it is bent.

10. Inspect coupling for loose connection.

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 8 (Continued)

COMPONENT: MOTOR/GEARMOTOR
CONTROL NUMBER: GS-III 06.06.08-8

Inspection Items (Continued)

11. Check rotating elements to see if they are out of balance.
12. Check for excess grease or oil in bearing housing.
13. Check for lack of lubrication.
14. Check for improper installation of bearings.
15. Check for dirt or rust on bearings.
16. Check rigidity of motor and gear reducer mounting and base.
17. Inspect gear reducer in accordance with the Manufacturer's Operation and Maintenance Manual.
18. Record the results.

Special Tools and Equipment

The following is a list of special tools and equipment, beyond the requirements listed in the Standard Tool Section.

1. Wrenches
2. Screwdrivers
3. Straightedge
4. Dial indicator
5. Vibration/sound level meter
6. Tapered thickness gauge or feeler gauges
7. Special tools as recommended by the equipment manufacturer.

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 8 (Continued)

COMPONENT: MOTOR/GEARMOTOR
CONTROL NUMBER: GS-III 06.06.08-8

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level I inspection.

References

1. Sverdrup Corporation

2. KATO Engineering, "Instruction Manual for Brushless Revolving Field Alternating Current Generators"

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 9

COMPONENT: CONTROLS
CONTROL NUMBER: GS-III 06.06.12-9

Application

This guide applies to the investigation of a hot terminal or device that is overheating from the flow of current through that terminal or device.

Special Safety Requirements

No special safety requirements are needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section.

Inspection Actions

1. Verify the findings of Level II inspection by using the Infrared Scanner and measuring the temperatures of the device and terminals. If the device or terminals are not hot as indicated by the findings of Level II inspection, check the current flow through the device or terminals. Heat generated is proportionate to the square of the current. If there is little or no current flow through the device or terminal at the time of measurement, there will be no significant amount of heat generated.

2. For terminal connections, verify the type of conductor being terminated. If the conductor is an aluminum conductor, look for evidence of cold flow or melt down of conductor.

3. If there is evidence of cold flow or melt down of the aluminum conductor, the conductor should either be replaced or shortened and reconnected. When making new aluminum conductor terminations a joint compound should be used.

4. If the terminal is loose it should be tightened. De-energize prior to attempting tightening of terminal connections.

5. If none of the above is the problem than there is an internal problem and an on-site analysis must be made to determine if additional inspections are to be made or the unit is to be replaced.

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 9 (Continued)

COMPONENT: CONTROLS
CONTROL NUMBER: GS-III 06.06.12-9

Special Tools and Equipment

The following is a list of special tools required beyond those listed in the Standard Tool Section.

1. Infrared Scanner, Raytek, Inc., #PM2EM-L2

2. Torque wrench

3. Digital Multimeter, Fluke #1TC676

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level II inspection.

References

1. Maintenance Technology/September 1993; Write-up Title: *"Infrared Keeps All Systems Go"*

2. Raining - Agema Infrared Systems; *"Measurement of Excess Temperatures with Infrared Scanners"*

06.07 BRIDGE CRANE

DESCRIPTION

A bridge crane is a machine for lifting and lowering a load with a single or multiple girders forming a movable bridge for carrying one or more hoisting mechanisms on trolleys traveling on overhead rails. Crane bridge system includes hoisting mechanism (hooks, chain/wire rope, block), trolley, bridge motors, control and runway/rails.

SPECIAL TOOL AND EQUIPMENT REQUIREMENTS

None.

SPECIAL SAFETY REQUIREMENTS

Follow applicable safety requirements set forth in the Master Safety Manual as augmented by local requirements if more stringent.

COMPONENT LIST

- 06.07.01 BRIDGE
- 06.07.02 MOTORS
- 06.07.03 DRIVE ASSEMBLY
- 06.07.04 POWER SUPPLY
- 06.07.05 CONTROLS
- 06.07.06 RUNWAY/RAILS
- 06.07.07 PIPING, FITTINGS AND HOSES

RELATED SUBSYSTEMS

Due to the related nature of the elements requiring inspection, the following sections should be reviewed for relevant and concurrent inspection activities. Of these, 06.09, Hoists, is always an element of this system. A bridge crane inspection is not complete until all hoists mounted on the bridge beam have been evaluated.

06.09	HOISTS
07.05	COMPRESSED AIR SYSTEMS - SHOP
10.02	BUILDING ELECTRICAL (Low Voltage Dist. System 600 V or less)
10.03	LIGHTING
10.07	POWER SOURCES

06.07 BRIDGE CRANE

STANDARD INSPECTION PROCEDURE

Prior to performing a Level I inspection, the inspector(s) should review existing records including as-built drawings, records of periodic inspection and maintenance logs. Since many bridge crane systems are maintained by service contract, it may be necessary to review contractual documentation to determine the scope of maintenance services provided from that source. Level I inspections for each individual bridge crane system may include the inspector observing routine operation of the crane by its designated operator and inspecting the related components. No load test will be made. The inspection will be scheduled to minimize interference to crane-related operation. Extreme care has to be taken to remain clear of the moving machinery or loads. The inspector shall not enter the crane cab or pulpit without the knowledge of the operator or other authorizing person.

Level I inspection requires one person making a visual examination and taking some measurements. The inspection shall be carried out on the basis of individual crane bridge installations as previously defined. Observed defects are to be recorded in the Field CAIS.

Level II inspections may require raising and lowering the hook through the full range of normal travel at rated speed for multiple complete cycles at various speeds. Proper operation of bridge crane limit switches will be verified. The inspector will observe the operation of the bridge and trolley in each direction the full distance between end stops. The bridge and trolley will be operated through their entire speed range and verify proper brake operation.

Bridge crane-related Level III inspections require a trained technician and helper. The inspection procedures and safety guidelines to be used are found in the reference material listed at the end of this section. Additional Level III inspections may be required to evaluate defects in bridge crane-related components such as those included in the electrical or compressed air systems, for instance.

COMPONENTS

◆ 06.07.01 BRIDGE

The bridge is that part of a crane consisting of one or more girders with structural connections to maintain alignment, wheels, bearing, axles, end ties, end trucks, catwalk and drive assembly. It also includes the rail system which carries the trolley or trolleys. The drive assembly including the braking systems is inspected as a separate component (06.07.03). The trolley is inspected as a component of the hoist (06.09).

Corrosion of bridge components: Check for corrosion of all bridge components. This is especially critical for cranes exposed to the elements or operating in corrosive atmospheres.

Physical damage: Look for bent, twisted or broken structural members, loose or missing connections. Deformation from overloading or distress caused by collision with loads or other building components. Provide comments in the remarks section.

06.07 BRIDGE CRANE

COMPONENTS (Continued)

◆ 06.07.01 BRIDGE (Continued)

Bridge alignment: Bridge alignment is easiest to check when the bridge is near the end of its runway. Check to see if one end truck reaches each end of the runway before the opposite end truck does. Observe the bridge as it moves from one end of the runway to the other. A metal screech emanating from the truck wheels could be an indicator of poor bridge alignment. Are changes in alignment visible from the shop floor?

Wheel and bearing damage: A series of wheels transfer the load to the rails . While newer installations use sealed self-aligning permanently lubricated anti-friction bearings designed for axial and thrust loading, older models do not. These older bearings are provided with fittings for pressure lubrication. A common defect is over-lubrication which leaves grease and oil on the rails.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
* **Corrosion of Bridge Components:**			
Observation:			
a. Surface corrosion (no pitting evident). ***{Severity L}	SF		
b. Corrosion evidenced by pitting or blistering. ***{Severity M}	SF		
c. Corrosion evidenced by holes or loss of base metal. ***{Severity H}	SF		

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
* **Physical Damage:**			
Observation:			
a. Structural members bent. ***{Severity H}	EA		6
b. Structural members broken. ***{Severity H}	EA		6
c. Connections loose or missing. ***{Severity H}	EA		6

06.07 BRIDGE CRANE

COMPONENTS (Continued)

◆ 06.07.01 BRIDGE (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Bridge Alignment:**			
Observation:			
a. Bridge twisted or torqued. ***{Severity M}	EA	1	6
b. Bridge out of alignment. ***{Severity H}	LF	1	6

Defect:

Defect	UOM	LEVEL II KEY	LEVEL III KEY
*** Wheel and Bearing Damage:**			
Observation:			
a. Noisy bearings. ***{Severity M}	EA		
b. Evidence of over/under lubrication. ***{Severity M}	EA		
c. Wheels damaged or worn. ***{Severity H}	EA		

06.07 BRIDGE CRANE

COMPONENTS (Continued)

◆ 06.07.02 MOTORS

Most often, bridge and trolley motors are single or variable speed, totally enclosed and non-ventilated type, provided with brake and fluid coupling or other mechanical device to provide smooth and even acceleration and deceleration. In some instances, air operated motors are used. For these, inspection procedures listed under Section 06.07.07, Piping, Fittings and Hoses, are also required.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Corrosion:**			
Inspect for all motors.			
Observation:			
a. Surface corrosion (no pitting evident). ***{Severity L}	SF		
b. Corrosion evidenced by pitting or blistering. ***{Severity M}	SF		
c. Corrosion evidenced by holes or loss of base metal. ***{Severity H}	SF		

Defect:

	UOM		
*** Housekeeping:**			
Inspect for all motors.			
Observation:			
a. Housings contaminated. ***{Severity L}	EA		
b. Motor dirty. ***{Severity M}	EA		

06.07 BRIDGE CRANE

COMPONENTS (Continued)

◆ 06.07.02 MOTORS (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Motor Related Structure Defects:**			
Inspect for all motors, drums and sprocket assemblies.			
Observation:			
a. Frame cracked or broken. ***{Severity M}	EA		
b. Support cracked or broken. ***{Severity M}	EA		
c. Support shifted. ***{Severity M}	EA		
d. Defective mounting pads. ***{Severity M}	EA		
e. Loose or missing mounting bolts. ***{Severity H}	EA		
f. Drum or sprocket assembly damaged. ***{Severity H}	EA		

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Electric Motor Operation:**			
Inspect for all electric motors.			
Observation:			
a. Excessively noisy. ***{Severity L}	EA		1
b. Excessive vibration. ***{Severity M}	EA		1
c. Excessive sparking at the collector rings, commutator, or brushes. ***{Severity M}	EA		2

06.07 BRIDGE CRANE

COMPONENTS (Continued)

◆ 06.07.02 MOTORS (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Air Motor Operation:**			
Inspect for all compressed air operated motors.			
Observation:			
a. Excessively noisy. ***{Severity L}	EA		1
b. Excessive vibration. ***{Severity M}	EA		1
c. Excessive oil discharge. ***{Severity M}	EA		
d. Muffler damaged or missing. ***{Severity M}	EA		

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Power Connections:**			
Inspect for all electric motors.			
Observation:			
a. Terminal box cover missing. ***{Severity L}	EA		
b. Insulation of motor leads damaged or deteriorated. ***{Severity M}	EA	2	
c. Taping improperly installed or deteriorated. ***{Severity M}	EA	2	
d. Unit not grounded. ***{Severity H}	EA	2	

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Hot Spots:**			
Inspect for all electric motors.			
Observation :			
a. Terminal 5° to 24°C above ambient. ***{Severity M}	EA	3	3
b. Terminal 25°C or more above ambient. ***{Severity H}	EA	3	3

06.07 BRIDGE CRANE

COMPONENTS (Continued)

◆ 06.07.03 DRIVE ASSEMBLY

The bridge drive assembly usually consists of single electrical motor mechanically connected through gear reduction and drive shaft to drive wheels, or of separate drive motors at each end of the bridge. Gear reducers are normally oil tight and fully enclosed with pressure or splash type lubrication. In some applications, air-driven motors are used.

Bridge braking systems are either electrical (such as regenerative, dynamic, countertorque or eddy-current braking) or mechanical, hydraulic, or air pressure operated for stopping the motion of the bridge.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Drive Assembly Inoperable:**			
Motors used in the drive assembly are to be inspected under 06.07.02 Motors.			
Observation:			
a. Shaft locked.	EA		
***{Severity H}			
b. Shaft broken.	EA		
***{Severity H}			
c. Worn or damaged gears.	EA		4
***{Severity H}			
Defect:			
*** Brake Deficiencies:**			
Observation:			
a. Improper adjustment.	EA		5
***{Severity L}			
b. Brake pads worn.	EA		5
***{Severity M}			
c. Assembly damaged.	EA		5
***{Severity H}			
d. Air or hydraulic leak.	EA		
***{Severity H}			
Defect:			
*** Corrosion:**			
Inspect all drive assembly components.			
Observation:			
a. Surface corrosion (no pitting evident).	SF		
***{Severity L}			
b. Corrosion evidenced by pitting or blistering.	SF		
***{Severity M}			
c. Corrosion evidenced by holes or loss of base metal.	SF		
***{Severity H}			

06.07 BRIDGE CRANE

COMPONENTS (Continued)

◆ 06.07.04 POWER SUPPLY

Electrical power is delivered to the bridge drive assembly as well as to hoists and trolleys through rigid or flexible conductors. The rigid power supply system depends on bare or patented shielded flat bar or structural shaped conductors. The power is transmitted to the trolley drive and hoist motors though specially designed collectors that travel with the trolley. EXTREME CAUTION IS REQUIRED BECAUSE INEXPERIENCED TECHNICIANS, UNAWARE OF THE SHOCK HAZARD, HAVE MISTAKEN THESE POWER CONDUCTORS FOR HANDRAILS.

Flexible conductors are of two types. Take-up reels are used for small systems, or the cable is suspended from a cable cars running on a track in a series of loops that do not extend below the bottom of the load support beam or bridge. Such systems consist of the cable, junction boxes, the cable track and cable cars. For air operated hoists, a similar arrangement is used to deliver the compressed air. For compressed air systems, inspect related components as required by Section 06.07.07 Piping, Fittings and Hoses.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Corrosion:**			
Observation:			
a. Surface corrosion (no pitting evident).	SF		
***{Severity L}			
b. Corrosion evidenced by pitting or blistering.	SF		
***{Severity M}			
c. Corrosion evidenced by holes or loss of base metal.	SF		
***{Severity H }			

Defect:

*** Physical Damage:**
Inspect for rigid and flexible power supply systems.

Observation:	UOM
a. Fasteners loose or missing.	EA
***{Severity M}	
b. Structural supports deformed or bent.	EA
***{Severity M}	

06.07 BRIDGE CRANE

COMPONENTS (Continued)

◆ 06.07.04 POWER SUPPLY (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
* **Runway Conductor and Collector Malfunction:**			
Observation:			
a. Damaged bar cover	EA	4	
***{Severity M}			
b. Shoe collector worn.	EA	4	
***{Severity H}			
c. Shoe collector loose or missing fastener.	EA	4	
***{Severity H}			
d. Shoe out of alignment.	EA	4	
***{Severity H}			
e. Insulators missing or cracked.	EA		
***{Severity H}			

Defect:

	UOM	LEVEL II KEY	LEVEL III KEY
* **Flexible Conductor Malfunction:**			
Observation:			
a. Cable/hose out of rail.	EA		
***{Severity M}			
b. Cable/hose car damaged.	EA		
***{Severity H}			
c. Cable/hose chafed or worn.	EA		
***{Severity H}			
d. Cable/hose under tension.	EA		
***{Severity H}			
e. Take-up reel binds or fails to take up slack.	EA		
***{Severity H}			
f. Insulation cracked or missing.	EA		
***{Severity H}			

06.07 BRIDGE CRANE

COMPONENTS (Continued)

◆ 06.07.05 CONTROLS

Bridge cranes are controlled by an operator either in a cab attached to the bridge, from a stationary pulpit similar to a cab, but stationary, or using a control pendant push-button system suspended from the bridge crane assembly.

Control system panels include trolley forward, trolley reverse, bridge forward, bridge reverse; hoist up, down and reset, stop. Pilot lights to indicate that power is available and other indicator lights are also furnished. Some control systems use foot pedals for some control sequences. Modern control systems rely on micro-chip controls for more accurate response. Some cranes transmit controls from the control station to the crane by radio controls.

Safety provisions, such as limit switches, overload protection, warning lights, bells and horns, as well as general illumination controls, are often a part of the bridge crane control system.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
* **Control Panel Damaged:**			
Observation:			
a. Pilot/indicator light lenses missing/cracked. ***{Severity M}	EA		
b. Switches, buttons loose or missing. ***{Severity H}	EA		
c. Pilot/indicator lights inoperable. ***{Severity H}	EA		

Defect:

* **Controls Inoperable:**			
Observation:			
a. Controls fail to respond to normal commands. ***{Severity H}	EA		7
b. Controls improperly marked. ***{Severity H}	EA		
c. Radio transmitter/receiver inoperable. ***{Severity H}	EA		7

06.07 BRIDGE CRANE

COMPONENTS (Continued)

◆ **06.07.05 CONTROLS (Continued)**

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
* **Limit Switches Inoperable:**			
Check limit switches that govern travel distance, speed and overload.			
Observation:			
a. Limit switches out of adjustment. ***{Severity M}	EA	5	
b. Bridge, trolley or hoist overruns limits. ***{Severity H}	EA	5	
c. Limit switches damaged/disconnected. ***{Severity H}	EA	5	

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
* **Warning Devices/Illumination Defective:**			
Observation:			
a. Warning lights, horns or bells damaged. ***{Severity M}	EA		
b. Crane mounted illumination inoperable. ***{Severity M}	EA		
c. Crane mounted illumination damaged. ***{Severity M}	EA		
d. Warning lights, horns or bells fail to operate. ***{Severity H}	EA		

06.07 BRIDGE CRANE

COMPONENTS (Continued)

◆ 06.07.06 RUNWAY/RAILS

Runway is the assembly of rail, beams, girders, and framework on which the crane travels. The bridge moves in a direction parallel to the crane runway. Trolleys travel on rails on the bridge in a direction perpendicular to the crane runway.

Bridges and trolleys should be provided with bumper or buffer for reducing impact when a moving bridge or trolley reaches the end of its permitted travel or to avoid contact with another crane or trolley running on the same rails. Bumpers or buffers may be attached to the bridge, trolley or the runway stop. These units are designed for emergency stops only. During normal operation, limit switches should stop the bridge or trolley before there is an impact with the bumper or buffer. A bumper provides a physical stop absorbing the kinetic energy caused by the collision by mechanical means. On the other hand, a buffer includes some hydraulic or pneumatic means of absorbing kinetic energy. Bumper systems may include compression-coil, coned-disc or flat spring types and may be made of steel, bronze, rubber, or plastic. Buffers may use hydraulic or pneumatic shock absorbers.

Rail damage: Rails should be level, straight and true to span. Joints should be smooth, level and in true alignment and offer no obstruction of movement.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
* **Rail Damage:**			
Observation:			
a. Rails covered with grease, oil, or paint.	LF		
***{Severity M}			
b. Rails worn.	LF		
***{Severity H}			
c. Loose or missing fasteners.	EA		
***{Severity H}			
d. Rails out of alignment.	LF	6	
***{Severity H}			
e. Rails or supporting members deflect under load.	EA		8
***{Severity H}			
f. Connection to building structure damaged.	EA		8
***{Severity H}			

06.07 BRIDGE CRANE

COMPONENTS (Continued)

◆ 06.07.06 RUNWAY/RAILS (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
* **Bumper (Buffer) Damaged:**			
Observation:			
a. Oil level low or leakage	EA		
***{Severity L}			
b. Pneumatic/hydraulic cylinder damaged.	EA		
***{Severity H}			
c. Bumper damaged or misaligned.	EA		
***{Severity H}			
d. Bumper spring broken or distorted.	EA		
***{Severity H}			

06.07 BRIDGE CRANE

COMPONENTS (Continued)

◆ 06.07.07 PIPING, FITTINGS AND HOSES

Piping, fittings and hoses provide distribution for the compressed air system or hydraulic fluid distribution for hoist trolley braking systems. Rigid piping is used whenever possible, but hoses and flexible piping are used to isolate the system from vibration and to supply moving components such as a trolley mounted hoist.

Fittings include valves for control, isolating components, maintenance (bleeding or draining the system), and pressure relief. Pipe fittings are welded, grooved, threaded or bolted flange type.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Corrosion:**			
Observation:			
a. Surface corrosion (no pitting evident).	LF		
***{Severity L}			
b. Corrosion evidenced by pitting or blistering.	LF		
***{Severity M}			
c. Corrosion evidenced by holes or loss of base metal.	LF		
***{Severity H}			

Defect:

*** Pipe Leakage:**
Observation:

a. Pipe inadequately supported.	LF		
***{Severity M}			
b. Pipe damaged.	LF		
***{Severity H}			

Defect:

*** Pipe Fittings Defective:**
Observation:

a. Fittings damaged.	EA		
***{Severity H}			
b. Fittings under tension.	EA		
***{Severity H}			

06.07 BRIDGE CRANE

COMPONENTS (Continued)

◆ 06.07.07 PIPING, FITTINGS AND HOSES (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Valve Leakage:**			
Observation:			
a. Valve seeps at stem or fittings.	EA		
***{Severity M}			
b. Valve leaks at stem or fittings.	EA		
***{Severity H}			
c. Muffler leakage.	EA		
***{Severity H}			

Defect:

	UOM		
*** Valve Inoperable:**			
Observation:			
a. Valve stem motion restricted by corrosion.	EA		
***{Severity M}			
b. Damaged operating mechanism.	EA		
***{Severity H}			

Defect:

	UOM		
*** Hose Damage:**			
Observation:			
a. Hose twisted or kinked.	EA		
***{Severity M}			
b. Hose chafed or worn.	LF		
***{Severity M}			
c. Hose under tension or load.	EA		
***{Severity H}			
d. Hose leaking.	EA		
***{Severity H}			

06.07 BRIDGE CRANE

REFERENCES

1. Applicable jurisdictional regulations as required

2. Master Safety Manual, Fluor Daniel

3. CMAA 70 Crane Manufacturers Association of America (1988), Electric Overhead Traveling Crane

4. MS MIL-C-28546 (Rev A; AM 2) Cranes, Overhead Traveling Overhung, Electric Powered

5. NFPA 70 National Fire Protection Association

6. AFBMA 9 Anti-Friction Bearing Manufacturer Association Inc. (1990), Load Bearings and Fatigue Life for Ball Bearings

7. AGMA 250.04 American Gear Manufacturer Association (AGMA) (1981), Lubrication of Industrial Enclosed Gear Drives

06.07 BRIDGE CRANE

LEVEL II KEY	GUIDE SHEET CONTROL NUMBER
1	GS-II 06.07.01-1
2	GS-II 06.07.02-2
3	GS-II 06.07.02-3
4	GS-II 06.07.04-4
5	GS-II 06.07.05-5
6	GS-II 06.07.06-6

LEVEL III KEY	GUIDE SHEET CONTROL NUMBER
1	GS-III 06.07.02-1
2	GS-III 06.07.02-2
3	GS-III 06.07.02-3
4	GS-III 06.07.03-4
5	GS-III 06.07.03-5
6	GS-III 06.07.01-6
7	GS-III 06.07.05-7
8	GS-III 06.07.06-8

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 1

COMPONENT: BRIDGE
CONTROL NUMBER: GS-II 06.07.01-1

Application

This guide applies to the investigation of the alignment of bridge crane bridges on their guide rails.

Special Safety Requirements

The following list of special safety requirements, beyond the requirements listed in the Master Safety Plan and System Safety Section, are to be observed in the performance of this inspection.

1. This inspection guide applies to bridge crane beams or bridges mounted at varying heights above the working floor. Follow all OSHA guidelines for safety straps to prevent falls and slips.

2. Notify the facility manager that the inspection is to be made.

3. Shut off power to crane and/or runway and put your own padlock on the crane disconnect. Place "DO NOT OPERATE" tag on disconnect. Use manufacturer's recommendation to properly lock out the crane.

4. If runway power is required to operate another crane, install rail stops or other effective means to prevent crane collision. Take special care to stay clear of energized conductors.

5. Rope off area under crane being inspected and post "WORKING OVERHEAD" signs.

6. Station a licensed operator in the cab or at the controls to move or operate the crane if required during the inspection. Prior to operating it, the operator must determine that all persons are clear of moving components.

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 1 (Continued)

COMPONENT: BRIDGE
CONTROL NUMBER: GS-II 06.07.01-1

Inspection Actions

1. Measure the lengths of the diagonals to determine if they are within 1/4" or other tolerance prescribed by the manufacturer. Report any loose alignment bolts.

2. Visually inspect bridge components for torqued members or deflections by sighting along them or applying a straight-edge to verify their alignment.

3. Report all misaligned components to the facility manager. The crane should not be used until its' safety has been verified by a factory-authorized technician.

4. Remove all lock-out, tag-out and safety equipment before notifying the facility manager that the inspection has been completed.

Recommended Inspection Frequency

Do a Level II inspection each time a Level I inspection indicates one is required. During normal use, this level of inspection is required every six months.

References

1. ANSI Standard B30.2.0

2. Whiting Crane Handbook, Whiting Corporation, Harvey, IL

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 2

COMPONENT: MOTORS
CONTROL NUMBER: GS-II 06.07.02-2

Application

This guide applies to the investigation of the inside of an enclosure, containing bare, energized, electrical parts.

Special Safety Requirements

The following list of special safety requirements, beyond the requirements listed in the Master Safety Plan and System Safety Section, are to be observed in the performance of this inspection.

1. This inspection guide applies to enclosures containing live electrical parts having a potential of 600 volts or less above ground. If the enclosure contains circuitry of higher potential, do not use this inspection guide.

2. Any enclosure that is padlocked for safety reason is not to be opened unless okayed by the person having control of the key.

3. Inspector needs to carefully open, inspect the inside and close the enclosure without shutting down the equipment, without creating a hazard to himself.

Inspection Actions

1. Open panels or doors carefully as required for doing the visual inspection.

2. Visually inspect for those physical damaged defects that are listed and tagged Level II Key No. as indicated above.

3. Close panels or doors carefully after the inspection is completed.

Recommended Inspection Frequency

Do a Level II inspection each time a Level I inspection indicates one is required.

References

1. Sverdrup Corporation

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 3

COMPONENT: MOTORS
CONTROL NUMBER: GS-II 06.07.02-3

Application

This guide applies to the investigation of the inside of an enclosure, containing bare, energized, electrical parts.

Special Safety Requirements

The following list of special safety requirements, beyond the requirements listed in the Master Safety Plan and System Safety Section, are to be observed in the performance of this inspection.

1. This inspection guide applies to enclosures containing live electrical parts having a potential of 600 volts or less above ground. If the enclosure contains circuitry of higher potential, do not use this inspection guide.

2. Any enclosure that is padlocked for safety reason is not to be opened unless okayed by the person having control of the key.

3. Inspector needs to carefully open, inspect the inside and close the enclosure without shutting down the equipment, and without creating a hazard to himself.

Inspection Actions

1. Open panels or doors carefully and to the degree required for scanning those devices being tested.

2. Make temperature measurements with an infrared scanner.

3. Measure the ambient temperature by measuring a spot on the inside of the enclosure that is least effected by any internal panel heat source.

4. Measure the temperature of the device specified.

5. Above ambient temperature is calculated by subtracting the ambient temperature from the device temperature.

6. Record the results.

7. Close panels or doors carefully after the inspection is complete.

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 3 (Continued)

COMPONENT: MOTORS
CONTROL NUMBER: GS-II 06.07.02-3

Recommended Inspection Frequency

Do a Level II inspection each time a Level I inspection is made.

References

1. Maintenance Technology/September 1993; Write-up Title: "Infrared Keeps All Systems Go"

2. Raining - Agema Infrared Systems; "Measurement of Excess Temperatures with Infrared Scanners"

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 4

COMPONENT: POWER SUPPLY
CONTROL NUMBER: GS-II 06.07.04-4

Application

This guide applies to the investigation of the inside of a runway conductor containing bare, energized, electrical parts.

Special Safety Requirements

The following list of special safety requirements, beyond the requirements listed in the Master Safety Plan and System Safety Section, are to be observed in the performance of this inspection.

1. This inspection guide applies to runway collectors and conductors containing live electrical parts having a potential of 600 volts or less above ground. If the enclosure contains circuitry of higher potential, do not use this inspection guide.
2. Before inspecting runway collectors and conductors, be sure that the power has been turned off and is tagged out, locked out as described in GS- 06.07.01-1.
3. Inspector needs to carefully inspect the runway collector an conductor enclosure without creating a hazard to himself.

Inspection Actions

1. Open inspection panels or guards carefully and to the degree required for inspection.
2. Check runway collectors for wear. Wheel-type collectors tend to wear at bushings.
3. Check conductors for wear and alignment.
4. Check insulators for cracks.
5. Check all electrical connections for tightness.
6. Remove all tools and inspection equipment before returning the crane back to operation.

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 4 (Continued)

COMPONENT: POWER SUPPLY
CONTROL NUMBER: GS-II 06.07.04-4

Recommended Inspection Frequency

Do a Level II inspection each time a Level I inspection indicates one is required. During normal use, this level of inspection is required every six months.

References

1. ANSI Standard B30.2.0

2. Whiting Crane Handbook, Whiting Corporation, Harvey, IL

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 5

COMPONENT: CONTROLS
CONTROL NUMBER: GS-II 06.07.05-5

Application

This guide applies to the investigation of limit switches that control the range of travel of various bridge components within safe limits. They contain energized, electrical parts.

Special Safety Requirements

The following list of special safety requirements, beyond the requirements listed in the Master Safety Plan and System Safety Section, are to be observed in the performance of this inspection.

1. This inspection guide applies to limit switches containing live electrical parts having a potential of 600 volts or less above ground. If the enclosure contains circuitry of higher potential, do not use this inspection guide.

2. Before inspecting limit switches, be sure that the power has been turned off and is tagged out, locked out as described in GS- 06.07.01-1.

3. Inspector needs to carefully inspect the limit switches without creating a hazard to himself.

Inspection Actions

1. Open enclosures carefully and to the degree required for inspection.

2. Check operating arms for freedom of motion.

3. Remove covers and check for contact tightness, corrosion, pitting or overheating.

4. Remove any jumpers that may have been installed.

Recommended Inspection Frequency

Do a Level II inspection each time a Level I inspection indicates one is required. During normal use, this level of inspection is required every six months.

References

1. ANSI Standard B30.2.0

2. Whiting Crane Handbook, Whiting Corporation, Harvey, IL

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 6

COMPONENT: RUNWAY/RAILS
CONTROL NUMBER: GS-II 06.07.06-6

Application

This guide applies to the investigation of the alignment of bridge crane guide rails.

Special Safety Requirements

The following list of special safety requirements, beyond the requirements listed in the Master Safety Plan and System Safety Section, are to be observed in the performance of this inspection.

1. This inspection guide applies to bridge crane rails mounted at varying heights above the working floor. Follow all OSHA guidelines for safety straps to prevent falls and slips.

2. Notify the facility manager that the inspection is to be made.

3. Shut off power to all cranes and runway and put your own padlocks on all crane disconnects. Place "DO NOT OPERATE" tag on all disconnects. Use manufacturer's recommendation to properly lock out the cranes.

4. Rope off area under crane being inspected and post "WORKING OVERHEAD" signs.

5. Station a licensed operator in the cab or at the controls to move or operate the crane if required during the inspection. Prior to operating it, the operator must determine that all persons are clear of moving components.

Inspection Actions

1. Measure the distance between rails to determine if they are within 1/8'' or other tolerance prescribed by the manufacturer. Report any loose alignment bolts.

2. Visually inspect rail components for torqued members or deflections. By sighting along them or applying a straight-edge to verify their alignment.

3. Report all misaligned components to the facility manager. The crane should not be used until its' safety has been verified by a factory-authorized technician.

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 6 (Continued)

COMPONENT: RUNWAY/RAILS
CONTROL NUMBER: GS-II 06.07.06-6

Inspection Actions (Continued)

4. Inspect connections to the building and rail support beams for tightness, damage or deflection.

5. Remove all lock-out, tag-out and safety equipment before notifying the facility manager that the inspection has been completed.

Recommended Inspection Frequency

Do a Level II inspection each time a Level I inspection indicates one is required. During normal use, this level of inspection is required every six months.

References

1. ANSI Standard B30.2.0

2. Whiting Crane Handbook, Whiting Corporation, Harvey, IL

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 1

COMPONENT: MOTORS
CONTROL NUMBER: GS-III 06.07.02-1

Application

This guide applies to the investigation of electrical motors having excessive noise or vibration symptoms.

Special Safety Requirements

No special safety requirements are needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section.

Inspection Actions

1. Verify the findings of Level I inspection by using the vibration/sound level meter and measure the velocity (inches/second, peak), displacement (mils, peak-peak) and noise (db). Compare reading with acceptable manufacturer tolerances.

2. Inspect bearings for defects or dryness.

3. Inspect electrical motor and load unit for misalignment.

4. Inspect electrical motor and load unit for proper mounting.

5. Inspect electrical motor and load unit for transfer of vibration from another source.

6. Inspect coupling for loose connection.

7. If none of the above is the problem, reference manufacturer troubleshooting guide for additional inspections or repairs to be made.

Special Tools and Equipment

The following is a list of special tools required beyond those listed in the Standard Tool Section.

1. Vibration/sound level meter, IDR Mechanalysis #1TC87

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level I inspection.

References

1. KATO Engineering, Instruction Manual for Brushless Revolving Field Alternating Current Generators

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 2

COMPONENT: MOTORS
CONTROL NUMBER: GS-III 06.07.02-2

Application

This guide applies to the investigation of excessive sparking at the collector rings, commutator or brushes.

Special Safety Requirements

No special safety requirements are needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section.

Inspection Actions

Level I Inspector will detect excessive sparking in the area of either the collector rings, commutator or brushes. Level III Inspector will perform the following tasks.

1. Verify that there is excessive sparking in the area of either the collector rings, commutator or brushes.
2. If there is a problem, stop the motor and evaluate the problems causing the sparking.
3. Classify the severity of the problem and recommend the procedure needed to correct the problem.
4. If the Level III Inspector can not evaluate the problem, recommend the next procedure required to further identify the correction procedure that needs to be followed.

Special Tools and Equipment

The following is a list of special tools required beyond those listed in the Standard Tool Section.

1. Wrenches
2. Feelers

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 2 (Continued)

COMPONENT: MOTORS
CONTROL NUMBER: GS-III 06.07.02-2

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level I inspection.

References

1. "Handbook of Building and Plant Maintenance, Forms and Checklists" by Roger W. Liska and Judith Morrison Liska.

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 3

COMPONENT: MOTORS
CONTROL NUMBER: GS-III 06.07.02-3

Application

This guide applies to the investigation of a hot terminal or device that is overheating from the flow of current through that terminal or device.

Special Safety Requirements

No special safety requirements are needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section.

Inspection Actions

1. Verify the findings of Level II inspection by using the Infrared Scanner and measuring the temperatures of the device and terminals. If the device or terminals are not hot as indicated by the findings of Level II inspection, check the current flow through the device or terminals. Heat generated is proportionate to the square of the current. If there is little or no current flow through the device or terminal at the time of measurement, there will be no significant amount of heat generated.

2. For terminal connections, verify the type of conductor being terminated. If the conductor is an aluminum conductor, look for evidence of cold flow or melt down of conductor.

3. If there is evidence of cold flow or melt down of the aluminum conductor, the conductor should either be replaced or shortened and reconnected. When making new aluminum conductor terminations a joint compound should be used.

4. If the terminal is loose it should be tightened. De-energize prior to attempting tightening of terminal connections.

5. If none of the above is the problem than there is an internal problem and an on-site analysis must be made to determine if additional inspections are to be made or the unit is to be replaced.

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 3 (Continued)

COMPONENT: MOTORS
CONTROL NUMBER: GS-III 06.07.02-3

Special Tools and Equipment

The following is a list of special tools required beyond those listed in the Standard Tool Section.

1. Infrared Scanner (Raytek, Inc., CAT #PM2EM-L2)

2. Torque wrench

3. Digital Multimeter, Fluke #1TC676

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level II inspection.

References

1. Maintenance Technology/September 1993; Write-up Title: Infrared Keeps All Systems Go

2. Raining - Agema Infrared Systems; Measurement of Excess Temperatures with Infrared Scanners

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 4

COMPONENT: DRIVE ASSEMBLY
CONTROL NUMBER: GS-III 06.07.03-4

Application

This guide applies to the investigation of drive assemblies.

Special Safety Requirements

The following list of special safety requirements, beyond the requirements listed in the Master Safety Plan and System Safety Section, are to be observed in the performance of this inspection.

1. This inspection guide applies to bridge crane rails mounted at varying heights above the working floor. Follow all OSHA guidelines for safety straps to prevent falls and slips.

2. Notify the facility manager that the inspection is to be made.

3. Shut off power to all cranes and runway and put your own padlocks on all crane disconnects. Place "DO NOT OPERATE" tag on all disconnects. Use manufacturer's recommendation to properly lock out the cranes.

4. Rope off area under crane being inspected and post "WORKING OVERHEAD" signs.

Inspection Actions

1. Clean gear covers and open them being careful not to allow dirt to get into the gear units.

2. Visually check for excessive backlash, wear, or cracks in gears and pinions. Check for broken or worn bearings or misalignment.

3. Rotating gears slowly, check gear teeth for pitting on flanks and along pitchline, and for featheredges along the tips of teeth.

4. Check gear oil for level and metal shavings.

5. Check coupling for tight bolts, elongation of holes and tightness of keys in keyways.

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 4 (Continued)

COMPONENT: DRIVE ASSEMBLY
CONTROL NUMBER: GS-III 06.07.03-4

Special Tools and Equipment

The following is a list of special tools required beyond those listed in the Standard Tool Section.

1. Wrenches

2. Feeler gages

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level I inspection. (Usually 6-month interval)

References

1. ANSI Standard B30.2.0

2. Whiting Crane Handbook, Whiting Corporation, Harvey, IL

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 5

COMPONENT: DRIVE ASSEMBLY
CONTROL NUMBER: GS-III 06.07.03-5

Application

This guide applies to the investigation of bridge crane braking systems.

Special Safety Requirements

The following list of special safety requirements, beyond the requirements listed in the Master Safety Plan and System Safety Section, are to be observed in the performance of this inspection.

1. This inspection guide applies to bridge crane rails mounted at varying heights above the working floor. Follow all OSHA guidelines for safety straps to prevent falls and slips.

2. Notify the facility manager that the inspection is to be made.

3. Shut off power to all cranes and runway and put your own padlocks on all crane disconnects. Place "DO NOT OPERATE" tag on all disconnects. Use manufacturer's recommendation to properly lock out the cranes.

4. Rope off area under crane being inspected and post "WORKING OVERHEAD" signs.

Inspection Actions

1. Check connection at coils.

2. Check lining wear and recommend replacement if worn to less than 1/16".

3. Check wheel for smoothness and concentricity.

4. Check wheel for tightness on shaft.

5. Check condition of pins, arms and springs and other brake parts for wear and alignment.

6. Check oil level for oil-immersed coils

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 5 (Continued)

COMPONENT: DRIVE ASSEMBLY
CONTROL NUMBER: GS-III 06.07.03-5

Special Tools and Equipment

The following is a list of special tools required beyond those listed in the Standard Tool Section.

1. Wrench set

2. Gages

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level I inspection. (Six months intervals but depending on crane usage.)

References

1. ANSI Standard B30.2.0

2. Whiting Crane Handbook, Whiting Corporation, Harvey, IL

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 6

COMPONENT: BRIDGE
CONTROL NUMBER: GS-III 06.07.01-6

Application

This guide has been prepared to identify the purpose of a Level III inspection and its more sophisticated test and inspection methods which may be appropriate to determine the cause and/or extent of defects recorded in Level I or Level II defect observations at the steel structural members and connections.

Whereas the purpose of the Level I inspection was to record the observable defects at the structural members and connections, this Level III inspection is performed to provide a thorough systematic evaluation of the observed defect and to make an assessment of it's effects, if left unchecked, on the safety, durability and stability of the structural member, connections, and their appurtenant works.

The Level III inspection should be performed when prompted by the results of a Level I or II inspection. The inspection should be performed by an engineer or multidisciplined team of engineers experienced in the design and construction of bridge cranes.

The results of the Level III inspection will be used to develop maintenance or remedial measure work strategy that will correct the existing deficiency conditions or to require continued monitoring of existing deficiency conditions on the structural members and connections.

In general, appropriate advanced inspection methods will be identified, recommended, and performed by or under the supervision of the inspection engineer personnel as part of the Level III test and inspection method. Advanced inspection methods will be assigned only after the assessment of defect conditions observed during a Level I or II inspection.

Special Safety Requirements

Level III inspection and testing must be performed with the prior approval of the Facility Manager who will barricade the affected area and provide other appropriate safety measures and safe access.

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 6 (Continued)

COMPONENT: BRIDGE
CONTROL NUMBER: GS-III 06.07.01-6

Inspection Action

1. Prior to making a field inspection of the observed defect, review all past records concerning the structural members, connections, and the defective component if available. These records may include pre-construction investigation records, design criteria and analysis records, available construction records, previous periodic maintenance inspection records and photographs taken during initial construction and subsequent inspections.

2. Perform inspection of the pertinent components where observed defects that triggered a Level III inspection are listed.

3. Make an assessment of the importance of individual defects observed for a given component at the bridge crane. Indicate priorities for any required maintenance, or remedial measure work.

4. Identify whether particular observed defects need additional or continued observation.

5. Assess the stability and safety of the bridge structure.

6. Prepare final cost estimate for advanced inspection methods required to determine the cause and extent of the observed defect.

7. Prepare cost estimate for required maintenance or remedial repair measures, as applicable.

Level III advanced inspection methods may be required for specific Level I and Level II defect conditions observed at a bridge crane. Level III advanced test or inspection methods and associated observed defects for structural members and connections include, but are not limited to the following:

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 6 (Continued)

COMPONENT: BRIDGE
CONTROL NUMBER: GS-III 06.07.01-6

Advanced Test or Inspection Method	Applicable Observed Defects
1. Grinding and or sandblasting, using caliper to measure section loss	corrosion of steel and section loss
2. Magnetic particle	cracks in steel or welds
3. Dye-Penetrant	cracks in steel or welds
3. Ultrasonic test	cracks and voids in steel
4. Survey measurements	member out-of-alignment

Special Instructions

Review as-built and design drawings of structure and connection.

Special Tools & Equipment Requirements

Grinder or sandblasting equipment
Surveying equipment
Industry required testing equipment needed to perform the advanced investigation method chosen

Recommended Inspection Frequency

As triggered by Level I and II defect/observations or every 3 years.

References

1. U.S. Department of transportation, Federal Highway Administration, Bureau of Public roads (DOT) Bridge Inspector's Training Manual, 1990 Edition

2. Bridge inspection and Rehabilitation, Parsons Brinckerhoff Edited by L.G. Silano, PE, 1993

3. Inspection of Bridges and Trestles NAVFAC MO-126, October 1991

4. AASHTO Manual for Maintenance Inspection of Bridges, American Association of State Highway and Transportation Officials

5. Micro Bridger (Version 1.0), U.S. Army Construction Engineering Research Laboratory

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 7

COMPONENT: CONTROL CENTER
CONTROL NUMBER: GS-III 06.07.05-7

Application

This guide applies to the investigation of controls that do not operate properly.

Special Safety Requirements

No special safety requirements are needed for the performance of the Level III inspection beyond those required in the Master Safety Plan and System Safety Section.

Inspection Actions

1. Inspect the device in accordance with the manufacturer's operation and maintenance manual.

2. Engage the manufacturer's authorized maintenance service or other competent service organization to troubleshoot and repair the device.

Special Tools and Equipment

The following is a list of special tools are required beyond those listed in the Standard Tool Section.

1. Special tools as recommended by the device manufacturer.

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level I inspection.

References

1. Sverdrup Corporation

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 8

COMPONENT: RUNWAY/RAILS
CONTROL NUMBER: GS-III 06.07.06-8

Application

This guide has been prepared to identify the purpose of a Level III inspection and its more sophisticated test and inspection methods which may be appropriate to determine the cause and/or extent of defects recorded in Level I or Level II defect observations at the runway/rails assembly.

Whereas the purpose of the Level I inspection was to record the observable defects at the runway/rails assembly, this Level III inspection is performed to provide a thorough systematic evaluation of the observed defect and to make an assessment of it's effects, if left unchecked, on the safety, durability and stability of the runway/rails assembly and it's appurtenant works.

The Level III inspection should be performed when prompted by the results of a Level I or II inspection. The inspection should be performed by an engineer or multidisciplined team of engineers experienced in the design and construction of bridge cranes.

The results of the Level III inspection will be used to develop maintenance or remedial measure work strategy that will correct the existing deficiency conditions or to require continued monitoring of existing deficiency conditions on the runway/rails assembly.

In general, appropriate advanced inspection methods will be identified, recommended, and performed by or under the supervision of the inspection engineer personnel as part of the Level III test and inspection method. Advanced inspection methods will be assigned only after the assessment of defect conditions observed during a Level I or II inspection.

Special Safety Requirements

Level III inspection and testing must be performed with the prior approval of the Facility Manager who will provide personnel to barricade the affected area and provide safety measures and safe access.

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 8 (Continued)

COMPONENT: RUNWAY/RAILS
CONTROL NUMBER: GS-III 06.07.06-8

Inspection Action

1. Prior to making a field inspection of the observed defect, review all past records concerning the runway/rails assembly and the defective component if available. These records may include pre-construction investigation records, design criteria and analysis records, available construction records, previous periodic maintenance inspection records, and photographs taken during initial construction and subsequent inspections.

2. Perform inspection of the pertinent components where observed defects that triggered a Level III inspection are listed.

3. Make an assessment of the importance of individual defects observed for a given component at the bridge crane. Indicate priorities for any required maintenance, or remedial measure work.

4. Identify whether particular observed defects need additional or continued observation.

5. Assess the stability and safety of the runway/rails assembly.

6. Prepare final cost estimate for advanced inspection methods required to determine the cause and extent of the observed defect.

7. Prepare cost estimate for required maintenance or remedial repair measures, as applicable.

Level III advanced inspection methods may be required for specific Level I and Level II defect conditions observed at a bridge crane. Level III advanced test or inspection methods and associated observed defects for the runway/rails assembly include, but are not limited to the following:

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 8 (Continued)

COMPONENT: RUNWAY/RAILS
CONTROL NUMBER: GS-III 06.07.06-8

Advanced Test or Inspection Method	Applicable Observed Defects
1. Grinding and or sandblasting, using caliper to measure section loss	corrosion of steel and section loss
2. Magnetic particle	cracks in steel or welds
3. Dye-Penetrant	cracks in steel or welds
3. Ultrasonic test	cracks and voids in steel
4. Survey measurements	member out-of-alignment

Special Instructions

Review as-built and design drawings of the runway/rails assembly.

Special Tools & Equipment Requirements

Grinder or sandblasting equipment
Surveying equipment
Industry required testing equipment needed to perform the advanced investigation method chosen

Recommended Inspection Frequency

As triggered by Level I and II defect/observations or every 3 years.

References

1. U.S. Department of transportation, Federal Highway Administration, Bureau of Public roads (DOT) Bridge Inspector's Training Manual, 1990 Edition

2. Bridge inspection and Rehabilitation, Parsons Brinckerhoff Edited by L.G. Silano, PE, 1993

3. Inspection of Bridges and Trestles NAVFAC MO-126, October 1991

4. AASHTO Manual for Maintenance Inspection of Bridges, American Association of State Highway and Transportation Officials

5. Micro Bridger (Version 1.0), U.S. Army Construction Engineering Research Laboratory

06.08 CHUTES

DESCRIPTION

Chutes are designed to be a convenient method of dropping trash or soiled linens from the upper floors of a building to the appropriate facility below. Trash and linen chutes are to be located in fire rated enclosures. Chutes must be vented through the roof by extending full chute size through the roof to a point 4'0" above the roof. Wood chutes are no longer acceptable.

Chute systems include the chute tube, intake and discharge doors. In addition, chute systems can include lighting, wash-down systems, fire protection systems, and related interlocking controls.

SPECIAL TOOL AND EQUIPMENT REQUIREMENTS

Hand-held portable radios will be required to facilitate communications between inspectors working on different building floors for Level II inspections.

SPECIAL SAFETY REQUIREMENTS

Follow applicable safety requirements set forth in the Master Safety Manual as augmented by local requirements if more stringent.

COMPONENT LIST

- 06.08.01 CHUTE TUBE
- 06.08.02 INTAKE AND DISCHARGE DOORS

RELATED SUBSYSTEMS

Due to the related nature of the elements requiring inspection, the following sections should be reviewed for relevant and concurrent inspection activities.

07.03	DOMESTIC WATER DISTRIBUTION SYSTEM
09.00	BUILDING FIRE PROTECTION
10.03	LIGHTING

06.08 CHUTES

STANDARD INSPECTION PROCEDURE

Prior to performing a Level I inspection, the inspector(s) should review existing records including as-built drawings, records of periodic inspection and maintenance logs. Level I inspections for each chute installation will include inspecting the related components at each floor level or landing, and inspecting the discharge area.

For Level I observations, the inspector will not enter the chute tube for safety reasons. In addition, extreme care has to be taken to remain clear of falling debris associated with these installations because of the random nature of chute use. No chute door interlocks will be disabled. All chutes will remain in service. Inspection requires one person making a visual examination and taking some measurements. The inspection shall be carried out on the basis of individual chute installations as previously defined. Defects are to be recorded on the Field CAIS.

Level II inspections may require opening of doors and simple overrides of chute door interlocks. The inspector may make additional visual observations of the chute tube without entering it. Interlock control cabinets may be opened. The same safety concerns listed for Level I inspections apply to Level II inspections.

No chute-related Level III inspections are anticipated.

06.08 CHUTES

COMPONENTS

◆ 06.08.01 CHUTE TUBE

Standard pre-engineered or custom fabricated chute tube systems are assembled without bolts, rivets or clips. Chute tube material is usually aluminized, galvanized, or stainless steel. Water supply lines are connected to flushing and sprinkler heads. Electrical power is supplied for chute lighting systems and low-voltage control and fire detection systems are provided in some installations. Chutes are normally supported at intervals by the building structure. Chutes must be securely anchored to the building structure. Interior surfaces must be smooth with no projections. Some chutes are equipped with general lighting.

Flushing system malfunction: Some chutes are equipped with a flushing or wash-down system. These systems use hot water and sometimes include a disinfectant dosing system.

Fire protection system defective: Chutes may contain fire detection and suppression systems. Check for physical damage.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
* **Structural Damage:**			
Observation:			
a. Chute panels buckled or bent.	EA		
***{Severity M}			
b. Chute has separated from walls or structure.	EA		
***{Severity H}			
c. Evidence of chute movement or vibration.	EA		
***{Severity H}			

Defect:

* **Damaged Interior Surfaces:**			
Observation:			
a. Dirt build-up in chute.	SF		
***{Severity M}			
b. Fasteners or other protrusions into chute.	EA		
***{Severity M}			
c. Panels separated, cracked, corroded.	SF		
***{Severity M}			

06.08 CHUTES

COMPONENTS (Continued)

◆ **06.08.01 CHUTE TUBE (Continued)**

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
* **Lighting System:**			
Observation:			
a. Light bulb requires replacement. ***{Severity L}	EA		
b. Light fixture damaged. ***{Severity M}	EA		

Defect:

* **Flushing System Malfunction:**			
Observation:			
a. System will not shut off/leaks. ***{Severity M}	EA		
b. System will not operate. ***{Severity M}	EA	1	
c. Disinfectant dosing system inoperable. EA ***{Severity M}	1		

Defect:

* **Fire Protection System Defective:**			
Observation:			
a. Sprinkler heads damaged. ***{Severity H}	EA		
b. Smoke/heat rise detector damaged. ***{Severity H}	EA		

06.08 CHUTES

COMPONENTS (Continued)

◆ 06.08.02 INTAKE AND DISCHARGE DOORS

Self-closing intake door is provided at each landing with positive catch and latch handle. Hopper type door for rubbish chute and hinged type doors for linen chutes are normally used. Key or foot operators that unlatch and open hopper doors may be provided. Electric interlocks that lock all other doors while any door is in use and also lock all doors if fire is detected in the chute are also provided for some installations.

The bottom of the chute is usually equipped with a discharge door equipped with a fusible link. Discharge door may not be required on small, non-hazardous-use chutes.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
* **Intake and Discharge Door Condition:**			
Observation:			
a. Loose or missing fasteners	EA		
***{Severity M}			
b. Damaged door	EA		
***{Severity M}			
c. Broken latch	EA		
***{Severity M}			
d. Fusible link missing/bypassed.	EA		
***{Severity H}			

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
* **Electric Interlock System Inoperable:**			
Observation:			
a. More than one door can be opened at a time.	EA	2	
***{Severity H}			
b. Interlock system fails to lock for fire test.	EA	2	
***{Severity H}			

06.08 CHUTES

REFERENCES

1. Applicable jurisdictional regulations as required
2. Master Safety Manual, Fluor Daniel

06.08 CHUTES

LEVEL II KEY	GUIDE SHEET CONTROL NUMBER
1	GS-II 06.08.01-1
2	GS-II 06.08.02-2

LEVEL III KEY	GUIDE SHEET CONTROL NUMBER

N/A

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 1

COMPONENT: CHUTE TUBES
CONTROL NUMBER: GS-II 06.08.01-1

Application

This guide applies to investigations of chute tube flushing and/or disinfectant dosing systems.

Special Safety Requirements

The following list of safety requirements, beyond the requirements listed in the Master Safety Plan and System Safety Section, are to be observed in the performance of this inspection.

1. This inspection guide applies to chute tubes containing flushing and/or disinfectant dosing systems. The inspector should avoid exposure to waste water or chemicals. In case of accidental contact, follow the manufacturer's instructions for decontamination or medical attention.

2. Any enclosure that is padlocked for safety reason is not to be opened unless okayed by the person having control of the key.

3. Inspector needs to open, inspect the inside and close the enclosure without shutting down the equipment.

Inspection Actions

1. Open panels or doors as required for doing the visual inspection.

2. Visually inspect for those physical damaged defects that cause the flushing or disinfectant dosing system not to operate.

3. Follow the manufacturer's recommended operating sequence for each system.

4. Record results.

5. Close panels or doors after the inspection is completed.

Recommended Inspection Frequency

Do a Level II inspection each time a Level I inspection indicates one is required.

References

1. Sverdrup Corporation

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 2

COMPONENT: INTAKE AND DISCHARGE DOORS (CHUTES)
CONTROL NUMBER: GS-II 06.08.02-2

Application

This guide applies to investigations of chute intake and discharge door electric interlock systems during normal operations and during fire tests.

Special Safety Requirements

The following list of safety requirements, beyond the requirements listed in the Master Safety Plan and System Safety Section, are to be observed in the performance of this inspection.

1. This inspection guide applies to chutes equipped with electric door interlock systems. The inspector should avoid exposure to electric wires and falling objects.
2. Any enclosure that is padlocked for safety reason is not to be opened unless okayed by the person having control of the key.
3. Inspector needs to open, inspect the inside and close the enclosure without shutting down the equipment.
4. More than one inspector is required for this investigation. Communications must be by hand-held radio. Shouting down into the tube increases the danger of being struck by falling objects and is to be avoided.
5. Notify building occupants and the local fire department of the impending operational test that may cause a false fire alarm and re-notify these parties at the conclusion of these tests.

Inspection Actions

1. Open panels or doors as required for doing the visual inspection. More than one inspector is required to attempt to open more than one chute door at the same time.
2. Visually inspect for those physical damage or defects that cause the door interlocking system to malfunction by allowing more than one door to the chute to be opened at one time during normal operation.
3. Initiate a fire-alarm test sequence. Visually inspect for those physical damage or defects that cause the door interlocking system to malfunction by allowing any door to the chute to be opened while the fire alarm is in progress.
4. Record results.
5. Close panels or doors after the inspection is completed.

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 2 (Continued)

COMPONENT: INTAKE AND DISCHARGE DOORS (CHUTES)
CONTROL NUMBER: GS-II 06.08.02-2

Recommended Inspection Frequency

Do a Level II inspection each time a Level I inspection indicates one is required.

References

1. Sverdrup Corporation

06.09 HOISTS

DESCRIPTION

Hoists are a suspended mechanism used for lifting or lowering a freely suspended (unguided) loads. Hoists are manually, electrically or air powered using chain or wire rope for lifting. A hoist assembly includes the hook, load block, wire rope (or chain), drum (or sprocket gearing), motor drive, and controls. Depending on its lifting capability, intended use, power source and configuration, hoists use a variety of control means including manual and electrical local controls as well as remote controls mounted in movable cabs or stationary pulpits. Hoist can be mounted directly to the building structure in a fixed position, move on crane rails, or be part of a more complex bridge crane installation as described in Section 06.07.

The load limit of a hoist is based on three factors: Its manufacturer's rated load, the condition of the hoist, and the capacity of the supporting structure.

SPECIAL TOOL AND EQUIPMENT REQUIREMENTS

Nonconducting ladders, lift platforms or cherry pickers are required depending on the mounting height of the hoist.

SPECIAL SAFETY REQUIREMENTS

Follow applicable safety requirements set forth in the Master Safety Manual. as augmented by local requirements if more stringent.

COMPONENT LIST

- ◆ 06.09.01 MOTOR AND WORKS HOUSING
- ◆ 06.09.02 CONTROLS
- ◆ 06.09.03 LOAD BLOCKS AND HOOKS
- ◆ 06.09.04 CHAIN
- ◆ 06.09.05 WIRE ROPE
- ◆ 06.09.06 HOIST BRAKING SYSTEM
- ◆ 06.09.07 TROLLEY
- ◆ 06.09.08 POWER SUPPLY
- ◆ 06.09.09 DRIVE ASSEMBLY
- ◆ 06.09.10 SUPPORTING STRUCTURE
- ◆ 06.09.11 PIPING, FITTINGS AND HOSES

RELATED SUBSYSTEMS

Due to the related nature of the elements requiring inspection, the following sections should be reviewed for relevant and concurrent inspection activities.

06.07	BRIDGE CRANE
07.05	COMPRESSED AIR SYSTEMS - SHOP
10.02	BUILDING ELECTRICAL (Low Voltage Dist. System 600 V or less)
10.03	LIGHTING
10.07	POWER SOURCES

06.09 HOISTS

STANDARD INSPECTION PROCEDURE

Prior to performing a Level I inspection, the inspector(s) should review existing records including as-built drawings, records of periodic inspection and maintenance logs. Since many hoists are maintained by service contract, it may be necessary to review contractual documentation to determine the scope of maintenance services provided from that source. Level I inspections for each hoist system will include inspecting the related components as shown in the WBS. Hoists may have remote control panels which also have to be inspected.

For Level I observations, extreme care must be taken to remain clear of moving loads. All hoists will remain in service. Inspection requires one person making a visual examination and taking some measurements. The inspection shall be carried out for each hoist installation as previously defined. Defects are to be recorded on the data collection device (DCD).

Level II inspections may require having the hoist operated by an authorized owner's representative within its normal operating range while the inspector makes visual observations of the hoist in motion. Control cabinets may be opened. The same safety concerns listed for Level I inspections apply to Level II inspections.

Hoist-related Level III inspections require a trained technician and helper. The inspection procedures and safety guidelines to be used are found in the reference material listed at the end of this section. Additional Level III inspections may be required to evaluate defects in hoist-related components such as those included in the electrical or compressed air systems, for instance.

COMPONENTS

◆ 06.09.01 MOTOR AND WORKS HOUSING

Operating parts of the hoist are mounted and enclosed in a sealed factory painted metal frame of malleable iron, cast steel, welded steel or aluminum. Most often, hoist motors are single or variable speed, totally enclosed and non-ventilated type; however, air operated motors are also used. For these, inspection procedures listed under Section 06.09.12 Piping, Fittings and Hoses are also required. The main lifting motor is connected to a rope drum or sprocket assembly to take up or play out the wire rope or lifting chain. In addition to the primary lifting motor, the hoist system may have additional motors to move the hoist trolley along its support beam.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
* **Corrosion:**			
Observation:			
a. Surface corrosion (no pitting evident).	SF		
***{Severity L}			
b. Corrosion evidenced by pitting or blistering.	SF		
***{Severity M}			
c. Corrosion evidenced by holes or loss of base metal.	SF		
***{Severity H}			

06.09 HOISTS

COMPONENTS (Continued)

◆ 06.09.01 MOTOR AND WORKS HOUSING (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Housekeeping:**			
Inspect for all motors, drums and sprocket assemblies.			
Observation:			
a. Housings contaminated.	EA		
***{Severity L}			
b. Motor dirty.	EA		
***{Severity M}}			

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Structure:**			
Inspect for all motors, drums and sprocket assemblies.			
Observation:			
a. Frame cracked or broken.	EA		
***{Severity M}			
b. Support cracked or broken.	EA		
***{Severity M}			
c. Support shifted.	EA		
***{Severity M}			
d. Defective mounting pads.	EA		
***{Severity M}			
e. Loose or missing mounting bolts.	EA		
***{Severity H}			
f. Drum or sprocket assembly damaged.	EA		
***{Severity H}			

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Electric Motor Operation:**			
Inspect for all electric motors.			
Observation:			
a. Excessively noisy.	EA		1
***{Severity L}			
b. Excessive vibration.	EA		1
***{Severity M}			
c. Excessive sparking at the collector rings, commutator, or brushes.	EA		2
***{Severity M}			

06.09 HOISTS

COMPONENTS (Continued)

◆ 06.09.01 MOTOR AND WORKS HOUSING (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Air Motor Operation:**			
Inspect for all compressed air operated motors.			
Observation:			
a. Excessively noisy. ***{Severity L}	EA		7
b. Excessive vibration. ***{Severity M}	EA		8
c. Excessive oil discharge. ***{Severity M}	EA		
d. Muffler damaged or missing. ***{Severity M}	EA		

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Power Connections:**			
Inspect for all electric motors.			
Observation:			
a. Terminal box cover missing. ***{Severity L}	EA		
b. Insulation of motor leads damaged or deteriorated. ***{Severity M}	EA	1	
c. Taping improperly installed or deteriorated. ***{Severity M}	EA	1	
d. Unit not grounded. ***{Severity H}	EA	1	

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Hot Spots:**			
Inspect for all electric motors.			
Observation :			
a. Terminal 5° to 24°C above ambient. ***{Severity M}	EA	2	3
b. Terminal 25° or more above ambient. ***{Severity H}	EA	2	3

06.09 HOISTS

COMPONENTS (Continued)

◆ 06.09.02 CONTROLS

Depending on its lifting capability, intended use, power source and configuration, hoists use a variety of control means including manual and electrical, local controls as well as remote controls mounted in movable cabs or stationary pulpits. Cab controls include buttons, levers and foot pedals. These types of controls are usually integrated with more sophisticated gantry or bridge crane controls. Often, but not always, the cab is mounted on the bridge beam. Remote control inspection criteria are included in Section 06.07 Bridge Crane.

Local controls can be of pendant, pull chain or rod control. Control actuators are automatically returned to the off position. Pendant control stations are designed to protect hoses or the electrical conductors against strain. Control functions include power off-on, hoist up-down, trolley right-left. Pull controls consist of two pull chains or cords with suitable handle clearly marked to indicate direction. Rod controls permit control of hoist motion by linear rotary movement of the rod handle or a combination of both. The rod handle should be clearly marked for direction of motion. Check limit switches that govern travel distance, speed and overload.

There is an increasing use of electronically assisted (computer or micro-chip) controls for modern hoist installations. Some hoists are radio-controlled.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
* **Control Panel Damaged:**			
Observation:			
a. Pilot/indicator light lenses missing/cracked. ***{Severity M}	EA		
b. Switches, buttons loose or missing. ***{Severity H}	EA	3	
c. Pilot/indicator lights inoperable. ***{Severity H}	EA	3	

Defect:

	UOM	LEVEL II KEY	LEVEL III KEY
* **Controls Inoperable:**			
Observation:			
a. Controls fail to respond to normal commands. ***{Severity H}	EA	3	9
b. Controls improperly marked. ***{Severity H}	EA	3	
c. Radio transmitter/receiver inoperable. ***{Severity H}	EA		9

06.09 HOISTS

COMPONENTS (Continued)

◆ 06.09.02 CONTROLS (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
* **Limit Switches Inoperable:**			
Observation:			
a. Limit switches out of adjustment. ***{Severity M}	EA	4	
b. Trolley or hoist overruns limits. ***{Severity H}	EA	4	
c. Limit switches damaged/disconnected. ***{Severity H}	EA	4	

Defect:

* **Warning Devices/Illumination Defective:**			
Observation:			
a. Warning lights, horns or bells damaged. ***{Severity M}	EA		
b. Crane mounted illumination inoperable. ***{Severity M}	EA		
c. Hoist mounted illumination damaged. ***{Severity M}	EA		
d. Warning lights, horns or bells fail to operate. ***{Severity H}	EA		

06.09 HOISTS

COMPONENTS (Continued)

◆ 06.09.03 LOAD BLOCKS AND HOOKS

Load blocks are the assembly of hook or shackle, swivel, bearing, pins, sprocket (or sheaves) and frame suspended by the load chain (or rope). For chain hoists, the block also includes the load chain container, where the slack load chain is stored as the block is raised from its lowest position.

Blocks should be enclosed type guarded against load chain (or rope) jamming or leaving the sheaves during normal operation condition. Hooks used to connect the load to the hoist and may also be used to suspend the hoist from a trolley or rigid structure. It may be equipped with a spring-loaded latch to bridge the opening of the hook as to prevent the load slings from slipping out of the hook.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Block Damaged or Worn:**			
Observation:			
a. Worn sheaves.	EA	5	
***{Severity M}			
b. Evidence of improper lubrication.	EA	5	
***{Severity M}			
c. Housing bent.	EA	5	
***{Severity M}			

Defect:

*** Hook Damaged or Worn:**			
Observation:			
a. Hook fails to swivel easily.	EA		
***{Severity M}			
b. Hook throat latch missing or damaged.	EA		
***{Severity M}			
c. Excessive wear, gouging.	EA		
***{Severity H}			
d. Hook twisted more than 10°.	EA		
***{Severity H}			
e. Visible cracks in bowl or back of hook.	EA	6	
***{Severity H}			
f. Hook shank nut loose or turned on shaft.	EA		
***{Severity H}			
g. Hook shank safety screw/pin in place.	EA		
***{Severity H}			

06.09 HOISTS

COMPONENTS (Continued)

◆ 06.09.04 CHAIN

For chain hoists, load chain is used to lift the load. Load chain is of two types: roller or welded link type. Their links are accurately pitched to pass over load sprockets without binding. If load is supported by more than one part of load chain, tension of the parts should be equalized. Additional uses of chains for hoist include manual raising and lowering of the load block, facilitating movement of the hoist trolley along the support beam, and actuating hoist or trolley controls. These secondary chains can be used even if the primary lifting means is wire rope.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
* **Physical Damage:**			
Observation:			
a. Chain links worn or cracked.	EA		
***{Severity H}			
b. Links stretched or deformed.	EA		
***{Severity H}			

Defect:

* **Corrosion:**			
Observation:			
a. Surface corrosion (no pitting evident).	SF		
***{Severity L}			
b. Corrosion evidenced by pitting or blistering.	SF		
***{Severity M}			
c. Corrosion evidenced by holes or loss of base metal.	SF		
***{Severity H}			

Defect:

* **Reeving Deficiencies:**			
Observation:			
a. Chain twisted.	EA		
***{Severity H}			
b. Parts of chain under unequal tension.	EA		
***{Severity H}			
c. Chain improperly anchored.	EA		
***{Severity H}			

06.09 HOISTS

COMPONENTS (Continued)

◆ 06.09.05 WIRE ROPE

Wire rope is used to support the load for wire rope hoists. Wire rope is reeved through blocks and sheaves. The ends should be attached to the hoist in a manner preventing disengagement while the hoist is being operated in the rated range for hook travel. While most wire rope has a fiber core, heavy duty installations may require high-strength steel core ropes. There are many reeving configurations consisting of single, double or multiple parts. In most instances, the rope is wound onto a grooved drum as the hoist block is raised.

Rope inspection should be concerned with discovering gross damage, such as distortion, general corrosion and broken or cut strands. The hoist owner should have a record of the last time the cable was replaced.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Cable Condition:**			
Observation:			
a. Loose or missing fasteners.	EA		
***{Severity H}			
b. Excessive cable wear.	LF		
***{Severity H}			
c. Cable damaged/frayed/distorted.	LF		
***{Severity H}			
d. Rope twisted or kinked.	LF		
***{Severity H}			

06.09 HOISTS

COMPONENTS (Continued)

◆ 06.09.06 HOIST BRAKING SYSTEM

The hoist controlling brake is used for slowing or stopping the motion of the load block by friction or by applying power without the use of motors. Since the load should be under the control of the operator at all times, multiple braking techniques may be used. In addition to the controlling brake, OSHA requires a separate brakes for holding the load once the controlling brake has brought it to a stop. The holding brake applies torque to stop and hold the load after it has been retarded by the control braking system. The holding brake must be self-setting. The holding brake is mounted either on the motor shaft or on an extension of one of the hoist gear unit shafts.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Corrosion:**			
Observation:			
a. Surface corrosion (no pitting evident). ***{Severity L}	SF		
b. Corrosion evidenced by pitting or blistering. ***{Severity M}	SF		
c. Corrosion evidenced by holes or loss of base metal. ***{Severity H}	SF		4

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Brake Deficiencies:**			
Observation:			
a. Improper adjustment. ***{Severity L}	EA		4
b. Brake pads worn. ***{Severity M}	EA		4
c. Assembly damaged. ***{Severity H}	EA		10
d. Air or hydraulic leak. ***{Severity H}	EA		
e. Holding brake fails to self-set. ***{Severity H}	EA		10

06.09 HOISTS

COMPONENTS (Continued)

◆ 06.09.07 TROLLEY

The trolley is a wheeled mechanism from which one or more hoists are suspended. The trolley provides horizontal motion of the hoist along a support beam or bridge. Trolleys may be a geared, hand-chain operated, manual drive type or powered types. For powered trolleys, the drive mechanism usually has a minimum of two wheels driven by an integral electric motor. Friction or power brakes are used for retarding or stopping trolley motion. The trolley unit consists of a frame and end trucks powered by the drive assembly.

Check for corrosion of all trolley components. This is especially critical for cranes exposed to the elements or operating in corrosive atmospheres. Also look for bent, twisted or broken structural members, loose or missing connections. Deformation from overloading or distress caused by collision with loads or other building components. Provide comments in the remarks section.

Trolley alignment is easiest to check when the trolley is near the end of its runway. Check to see if one end truck reaches each end of the runway before the opposite end truck does. Observe the trolley as it moves from one end of the runway to the other. A metal screech emanating from the trolley wheels could be an indicator of poor trolley alignment. Are changes in alignment visible from the shop floor?

Wheel and bearing damage is an important inspection criterion. A series of wheels transfer the load to the rails. While newer installations use sealed self-aligning permanently lubricated anti-friction bearings designed for axial and thrust loading, older models do not. These older bearings are provided with fittings for pressure lubrication. A common defect is over lubrication which leaves grease and oil on the rails.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Corrosion of Trolley Components:**			
Observation:			
a. Surface corrosion (no pitting evident). ***{Severity L}	SF		
b. Corrosion evidenced by pitting or blistering. ***{Severity M}	SF		
c. Corrosion evidenced by holes or loss of base metal. ***{Severity H}	SF		

06.09 HOISTS

COMPONENTS (Continued)

◆ 06.09.07 TROLLEY (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Physical Damage:**			
Observation:			
a. Structural members bent.	EA		
***{Severity H}			
b. Structural members broken.	EA		
***{Severity H}			
c. Connections loose or missing.	EA		
***{Severity H}			
Defect:			
*** Trolley Alignment:**			
Observation:			
a. Worn trolley wheels.	EA		
***{Severity M}			
b. Excessively noisy.	EA		11
***{Severity M}			
c. Trolley out of alignment.	LF	7	12
***{Severity H}			
Defect:			
*** Wheel and Bearing Damage:**			
Observation:			
a. Noisy bearings.	EA		
***{Severity M}			
b. Evidence of over/under lubrication.	EA		
***{Severity M}			
c. Wheels damaged or worn.	EA		
***{Severity H}			

06.09 HOISTS

COMPONENTS (Continued)

◆ 06.09.08 POWER SUPPLY

Electrical power is delivered to hoists and trolleys through rigid or flexible conductors. The rigid power supply system depends on bare or patented shielded flat bar or structural shaped conductors. The power is transmitted to the trolley drive and hoist motors though specially designed collectors that travel with the trolley. EXTREME CAUTION IS REQUIRED BECAUSE INEXPERIENCED TECHNICIANS, UNAWARE OF THE SHOCK HAZARD, HAVE MISTAKEN THESE POWER CONDUCTORS FOR HANDRAILS.

Flexible conductors are of two types. Take-up reels are used for small systems, or the cable is suspended from a track in a series of loops that do not extend below the bottom of the load support beam or bridge. Such systems consist of the cable, junction boxes, the cable track and cable cars. For compressed air systems, inspect related components as required by Section 06.07.07 Piping, Fittings and Hoses.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
* **Corrosion:**			
Observation:			
a. Surface corrosion (no pitting evident). ***{Severity L}	SF		
b. Corrosion evidenced by pitting or blistering. ***{Severity M}	SF		
c. Corrosion evidenced by holes or loss of base metal. ***{Severity H}	SF		

Defect:

* **Physical Damage:**			
Inspect for rigid and flexible power supply systems.			
Observation:			
a. Fasteners loose or missing. ***{Severity M}	EA		
b. Structural supports deformed or bent. ***{Severity M}	EA		

06.09 HOISTS

COMPONENTS (Continued)

◆ **06.09.08 POWER SUPPLY (Continued)**

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
* **Trolley Conductor and Collector Malfunction:**			
Observation:			
a. Damaged bar cover. ***{Severity M}	EA	8	
b. Shoe collector worn. ***Severity H}	EA	8	
c. Shoe collector loose or missing fastener. ***{Severity H}	EA	8	
d. Shoe out of alignment. ***Severity H}	EA	8	
e. Insulators missing or cracked. ***Severity H}	EA		

Defect:

* **Flexible Conductor Malfunction:**			
Observation:			
a. Cable/hose out of rail. ***{Severity M}	EA		
b. Cable/hose car damaged. ***Severity H}	EA		
c. Cable/hose chafed or worn. ***{Severity H}	EA		
d. Cable/hose under tension. ***Severity H}	EA		
e. Take-up reel binds or fails to take up slack. ***Severity H}	EA		
f. Insulation cracked or missing. ***Severity H}	EA		

06.09 HOISTS

COMPONENTS (Continued)

◆ 06.09.09 DRIVE ASSEMBLY

For powered trolleys, the drive mechanism has a minimum of two wheels driven by an integral electric motor. Because the distance between trolley wheels is small, alignment problems are less severe than for crane bridges. Friction or power brakes are used for retarding or stopping trolley motion.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Drive Assembly Inoperable:**			
Observation:			
a. Shaft locked.	EA		
***{Severity M}			
b. Worn or damaged gears.	EA		5
***{Severity M}			

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Brake Deficiencies:**			
Observation:			
a. Improper adjustment.	EA		6
***{Severity L}			
b. Brake pads worn.	EA		6
***{Severity M}			
c. Assembly damaged.	EA		7
***{Severity H}			
d. Air or hydraulic leak.	EA		
***{Severity H}			

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Corrosion:**			
Observation:			
a. Surface corrosion (no pitting evident).	SF		
***{Severity L}			
b. Corrosion evidenced by pitting or blistering.	SF		
***{Severity M}			
c. Corrosion evidenced by holes or loss of base metal.	SF		
***{Severity H}			

06.09 HOISTS

COMPONENTS (Continued)

◆ 06.09.10 SUPPORTING STRUCTURE

A load beam extends the full length of the intended operating range of the hoist system. The trolley travels along rails mounted to these beams. For stationary applications, the hoist system is mounted directly to a supporting beam. The limit of inspection of the supporting structure is the connection of the beam or hoist to the building structure. Evidence of structural failure of the building should be reported immediately to the Facility Manager. Rails should be level, straight and true to span. Joints should be smooth, level and in true alignment and offer no obstruction of movement.

Trolleys should be provided with bumper or buffer for reducing impact when a moving trolley reaches the end of its permitted travel or to avoid contact with another trolley running on the same rails. Bumpers or buffers may be attached to the trolley or the runway stop. These units are designed for emergency stops only. During normal operation, limit switches should stop the trolley before there is an impact with the bumper or buffer.

A bumper provides a physical stop absorbing the kinetic energy caused by the collision by mechanical means. On the other hand, a buffer includes some hydraulic or pneumatic means of absorbing kinetic energy. Bumper systems may include compression-coil, coned-disc or flat spring types and may be made of steel, bronze, rubber, or plastic. Buffers may use hydraulic or pneumatic shock absorbers.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
* **Rail or Support Beam Damage:**			
Observation:			
a. Rail covered with grease, oil or paint.	LF		
***{Severity M}			
b. Rails worn.	LF		
***{Severity H}			
c. Loose or missing fasteners.	EA		
***{Severity H}			
d. Rails/beam out of alignment.	LF	9	
***{Severity H}			
e. Rails or supporting members deflect under load.	LF		13
***{Severity H}			
f. Connection to building structure damaged. Movement, deformation or missing fasteners.	EA		13
***{Severity H}			

06.09 HOISTS

COMPONENTS (Continued)

◆ **06.09.10 SUPPORTING STRUCTURE (Continued)**

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
* **Bumper (Buffer) Damaged:**			
Observation:			
a. Oil level low or leakage	EA		
***{Severity L}			
b. Pneumatic/hydraulic cylinder damaged.	EA		
***{Severity H}			
c. Bumper damaged or misaligned.	EA		
***{Severity H}			
d. Bumper spring broken or distorted.	EA		
***{Severity H}			

Defect:

* **Single-Point Anchor Damaged:**			
Observation:			
a. Load hook deformed.	EA		
***{Severity H}			
b. Anchor bolts loose or missing.	EA		
***{Severity H}			

06.09 HOISTS

COMPONENTS (Continued)

◆ 06.09.11 PIPING, FITTINGS AND HOSES

Piping, fittings and hoses provide distribution for the compressed air system or hydraulic fluid distribution for hoist trolley braking systems. Rigid piping is used whenever possible, but hoses and flexible piping are used to isolate the system from vibration and to supply moving components such as a trolley mounted hoist.

Fittings include valves for control, isolating components, maintenance (bleeding or draining the system), and pressure relief. Pipe fittings are welded, grooved, threaded or bolted flange type.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Corrosion:**			
Observation:			
a. Surface corrosion (no pitting evident). ***{Severity L}	LF		
b. Corrosion evidenced by pitting or blistering. ***{Severity M}	LF		
c. Corrosion evidenced by holes or loss of base metal. ***{Severity H}	LF		

Defect:

*** Pipe Leakage:**			
Observation:			
a. Pipe inadequately supported. ***{Severity M}	LF		
b. Pipe damaged. ***{Severity H}	LF		

Defect:

*** Pipe Fittings Defective:**			
Observation:			
a. Fittings damaged. ***{Severity H}	EA		
b. Fittings under tension. ***{Severity H}	EA		

06.09 HOISTS

COMPONENTS (Continued)

◆ **06.09.11 PIPING, FITTINGS AND HOSES (Continued)**

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Valve Leakage:**			
Observation:			
a. Valve seeps at stem or fittings.	EA		
***{Severity M}			
b. Valve leaks at stem or fittings.	EA		
***{Severity H}			
c. Muffler leakage.	EA		
***{Severity H}			

Defect:

*** Valve Inoperable:**			
Observation:			
a. Valve stem motion restricted by corrosion.	EA		
***{Severity M}			
b. Damaged operating mechanism.	EA		
***{Severity H}			

Defect:

*** Hose Damage:**			
Observation:			
a. Hose twisted or kinked.	LF		
***{Severity M}			
b. Hose chafed or worn.	LF		
***{Severity M}			
c. Hose under tension or load.	EA		
***{Severity H}			
d. Hose leaking.	EA		
***{Severity H}			

06.09 HOISTS

REFERENCES

1. Applicable jurisdictional regulations as required

2. Master Safety Manual, Fluor Daniel

06.09 HOISTS

LEVEL II KEY	GUIDE SHEET CONTROL NUMBER
1	GS-II 06.09.01-1
2	GS-II 06.09.01-2
3	GS-II 06.09.01-3
4	GS-II 06.09.01-4
5	GS-II 06.09.01-5
6	GS-II 06.09.01-6
7	GS-II 06.09.01-7
8	GS-II 06.09.01-8
9	GS-II 06.09.01-9

LEVEL III KEY	GUIDE SHEET CONTROL NUMBER
1	GS-III 06.09.01-1
2	GS-III 06.09.01-2
3	GS-III 06.09.01-3
4	GS-III 06.09.06-4
5	GS-III 06.09.09-5
6	GS-III 06.09.09-6
7	GS-III 06.09.01-7
8	GS-III 06.09.01-8
9	GS-III 06.09.02-9
10	GS-III 06.09.06-10
11	GS-III 06.09.07-11
12	GS-III 06.09.07-12
13	GS-III 06.09.10-13

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 1

COMPONENT: MOTOR AND WORKS HOUSING
CONTROL NUMBER: GS-II 06.09.01-1

Application

This guide applies to the investigation of the inside of an enclosure, containing bare, energized, electrical parts.

Special Safety Requirements

The following list of special safety requirements, beyond the requirements listed in the Master Safety Plan and System Safety Section, are to be observed in the performance of this inspection.

1. This inspection guide applies to enclosures containing live electrical parts having a potential of 600 volts or less above ground. If the enclosure contains circuitry of higher potential, do not use this inspection guide.

2. Any enclosure that is padlocked for safety reason is not to be opened unless okayed by the person having control of the key.

3. Inspector needs to carefully open, inspect the inside and close the enclosure without shutting down the equipment and without creating a hazard to himself.

Inspection Actions

1. Open panels or doors carefully as required for doing the visual inspection.

2. Visually inspect for those physical damaged defects that are listed and tagged Level II Key No. as indicated above.

3. Close panels or doors carefully after the inspection is completed.

Recommended Inspection Frequency

Do a Level II inspection each time a Level I inspection indicates one is required.

References

1. Sverdrup Corporation

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 2

COMPONENT: MOTOR AND WORKS HOUSING
CONTROL NUMBER: GS-II 06.09.01-2

Application

This guide applies to the investigation of the inside of an enclosure, containing bare, energized, electrical parts.

Special Safety Requirements

The following list of special safety requirements, beyond the requirements listed in the Master Safety Plan and System Safety Section, are to be observed in the performance of this inspection.

1. This inspection guide applies to enclosures containing live electrical parts having a potential of 600 volts or less above ground. If the enclosure contains circuitry of higher potential, do not use this inspection guide.

2. Any enclosure that is padlocked for safety reason is not to be opened unless okayed by the person having control of the key.

3. Inspector needs to carefully open, inspect the inside and close the enclosure without shutting down the equipment, and without creating a hazard to himself.

Inspection Actions

1. Open panels or doors carefully and to the degree required for scanning those devices being tested.

2. Make temperature measurements with an infrared scanner.

3. Measure the ambient temperature by measuring a spot on the inside of the enclosure that is least effected by any internal panel heat source.

4. Measure the temperature of the device specified.

5. Above ambient temperature is calculated by subtracting the ambient temperature from the device temperature.

6. Record the results.

7. Close panels or doors carefully after the inspection is complete.

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 2 (Continued)

COMPONENT: MOTOR AND WORKS HOUSING
CONTROL NUMBER: GS-II 06.09.01-2

Recommended Inspection Frequency

Do a Level II inspection each time a Level I inspection is made.

References

1. Maintenance Technology/September 1993; Write-up Title: "Infrared Keeps All Systems Go"

2. Raining - Agema Infrared Systems; "Measurement of Excess Temperatures with Infrared Scanners"

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 3

COMPONENT: CONTROLS
CONTROL NUMBER: GS-II 06.09.02-3

Application

This guide applies to the investigation of control panels that control the functions of the hoist within safe limits. They contain energized, electrical parts.

Special Safety Requirements

The following list of special safety requirements, beyond the requirements listed in the Master Safety Plan and System Safety Section, are to be observed in the performance of this inspection.

1. This inspection guide applies to control panels containing live electrical parts having a potential of 600 volts or less above ground. If the enclosure contains circuitry of higher potential, do not use this inspection guide.

2. This inspection guide applies to hoists mounted at varying heights above the working floor. Follow all OSHA guidelines for safety straps to prevent falls and slips.

3. Notify the facility manager that the inspection is to be made.

4. Shut off power to hoist, crane, and/or runway and put your own padlock on the crane disconnect. Place "DO NOT OPERATE" tag on disconnect. Use manufacturer's recommendation to properly lock out all components.

5. If runway power is required to operate another crane or hoist, install rail stops or other effective means to prevent crane or hoist collision. Take special care to stay clear of energized conductors.

6. Rope off area under the hoist being inspected and post "WORKING OVERHEAD" signs.

7. Station a licensed operator in the cab or at the controls to move or operate the crane or hoist if required during the inspection. Prior to operating it, the operator must determine that all persons are clear of moving components.

8. Inspector needs to carefully inspect the control panels without creating a hazard to himself.

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 3 (Continued)

COMPONENT: CONTROLS
CONTROL NUMBER: GS-II 06.09.02-3

Inspection Actions

1. Open enclosures carefully and to the degree required for inspection.
2. Check each contactor for binding or excessive looseness.
3. Inspect each contact tip for evidence of burning, pitting or wear.
4. Check fuses.
5. Look for parts that have fallen to the bottom of the enclosure.
6. Check timer operation and settings.
7. Verify that panel doors close and lock as designed.

Recommended Inspection Frequency

Do a Level II inspection each time a Level I inspection indicates one is required. During normal use, this level of inspection is required every six months.

References

1. ANSI Standard B30.2.0
2. Whiting Crane Handbook, Whiting Corporation, Harvey, IL

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 4

COMPONENT: CONTROLS
CONTROL NUMBER: GS-II 06.09.02-4

Application

This guide applies to the investigation of limit switches that control the range of travel of various hoist components within safe limits. They contain energized, electrical parts.

Special Safety Requirements

The following list of special safety requirements, beyond the requirements listed in the Master Safety Plan and System Safety Section, are to be observed in the performance of this inspection.

1. This inspection guide applies to limit switches containing live electrical parts having a potential of 600 volts or less above ground. If the enclosure contains circuitry of higher potential, do not use this inspection guide.

2. Before inspecting limit switches, be sure that the power has been turned off and is tagged out, locked out as described in GS- 06.09.02-3.

3. Inspector needs to carefully inspect the limit switches without creating a hazard to himself.

Inspection Actions

1. Open enclosures carefully and to the degree required for inspection.

2. Check operating arms for freedom of motion.

3. Remove covers and check for contact tightness, corrosion, pitting or overheating.

4. Remove any jumpers that may have been installed.

Recommended Inspection Frequency

Do a Level II inspection each time a Level I inspection indicates one is required. During normal use, this level of inspection is required every six months.

References

1. ANSI Standard B30.2.0

2. Whiting Crane Handbook, Whiting Corporation, Harvey, IL

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 5

COMPONENT: LOAD BLOCKS AND HOOKS
CONTROL NUMBER: GS-II 06.09.03-5

Application

This guide applies to the investigation of load blocks.

Special Safety Requirements

The following list of special safety requirements, beyond the requirements listed in the Master Safety Plan and System Safety Section, are to be observed in the performance of this inspection.

1. This inspection guide applies to hoists mounted at varying heights above the working floor. Follow all OSHA guidelines for safety straps to prevent falls and slips.

2. Notify the facility manager that the inspection is to be made.

3. Rope off area under the hoist being inspected and post "WORKING OVERHEAD" signs.

4. Station a licensed operator in the cab or at the controls to move or operate the crane or hoist if required during the inspection. Prior to operating it, the operator must determine that all persons are clear of moving components.

5. Inspector needs to carefully inspect the these components without creating a hazard to himself.

Inspection Actions

1. Inspect block for worn sheaves, or bent housing. Open enclosures carefully and to the degree required for inspection.

2. Verify proper degree of lubrication. Over lubrication is as undesirable as under lubrication.

3. Replace cover plates.

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 5 (Continued)

COMPONENT: LOAD BLOCKS AND HOOKS
CONTROL NUMBER: GS-II 06.09.03-5

Recommended Inspection Frequency

Do a Level II inspection each time a Level I inspection indicates one is required. During normal use, this level of inspection is required every six months.

References

1. ANSI Standard B30.2.0

2. Whiting Crane Handbook, Whiting Corporation, Harvey, IL

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 6

COMPONENT: LOAD BLOCKS AND HOOKS
CONTROL NUMBER: GS-II 06.09.03-6

Application

This guide applies to the investigation of crane/hoist hooks.

Special Safety Requirements

The following list of special safety requirements, beyond the requirements listed in the Master Safety Plan and System Safety Section, are to be observed in the performance of this inspection.

1. This inspection guide applies to hoists mounted at varying heights above the working floor. Follow all OSHA guidelines for safety straps to prevent falls and slips.

2. Notify the facility manager that the inspection is to be made.

3. Rope off area under the hoist being inspected and post "WORKING OVERHEAD" signs.

4. Station a licensed operator in the cab or at the controls to move or operate the crane or hoist if required during the inspection. Prior to operating it, the operator must determine that all persons are clear of moving components.

5. Inspector needs to carefully inspect the these components without creating a hazard to himself.

Inspection Actions

1. Inspect hook for excessive wear, gouging, or visible cracks in the bowl and back of the hook.

2. Measure hook throat opening. Hook must be replaced if the opening measures more that 1.15 of its original dimension.

Recommended Inspection Frequency

Do a Level II inspection each time a Level I inspection indicates one is required. During normal use, this level of inspection is required every six months.

References

1. ANSI Standard B30.2.0

2. Whiting Crane Handbook, Whiting Corporation, Harvey, IL

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 7

COMPONENT: TROLLEY
CONTROL NUMBER: GS-II 06.09.07-7

Application

This guide applies to the investigation of crane/hoist trolleys.

Special Safety Requirements

The following list of special safety requirements, beyond the requirements listed in the Master Safety Plan and System Safety Section, are to be observed in the performance of this inspection.

1. This inspection guide applies to hoists mounted at varying heights above the working floor. Follow all OSHA guidelines for safety straps to prevent falls and slips.

2. Notify the facility manager that the inspection is to be made.

3. Shut off power to hoist, crane, and/or runway and put your own padlock on the crane disconnect. Place "DO NOT OPERATE" tag on disconnect. Use manufacturer's recommendation to properly lock out all components.

4. If runway power is required to operate another crane or hoist, install rail stops or other effective means to prevent crane or hoist collision. Take special care to stay clear of energized conductors.

5. Rope off area under the hoist being inspected and post "WORKING OVERHEAD" signs.

6. Station a licensed operator in the cab or at the controls to move or operate the crane or hoist if required during the inspection. Prior to operating it, the operator must determine that all persons are clear of moving components.

7. Inspector needs to carefully inspect the these components without creating a hazard to himself.

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 7 (Continued)

COMPONENT: TROLLEY
CONTROL NUMBER: GS-II 06.09.07-7

Inspection Actions

1. Measure the lengths of the diagonals to determine if they are within 1/4" or other tolerance prescribed by the manufacturer. Report any loose alignment bolts.

2. Visually inspect trolley components for torqued members or deflections. By sighting along them or applying a straight-edge to verify their alignment.

3. Report all misaligned components to the facility manager. The trolley should not be used until its' safety has been verified by a factory-authorized technician.

4. Remove all lock-out, tag-out and safety equipment before notifying the facility manager that the inspection has been completed.

Recommended Inspection Frequency

Do a Level II inspection each time a Level I inspection indicates one is required. During normal use, this level of inspection is required every six months.

References

1. ANSI Standard B30.2.0

2. Whiting Crane Handbook, Whiting Corporation, Harvey, IL

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 8

COMPONENT: POWER SUPPLY
CONTROL NUMBER: GS-II 06.09.08-8

Application

This guide applies to the investigation of the inside of a trolley conductor containing bare, energized, electrical parts.

Special Safety Requirements

The following list of special safety requirements, beyond the requirements listed in the Master Safety Plan and System Safety Section, are to be observed in the performance of this inspection.

1. This inspection guide applies to trolley collectors and conductors containing live electrical parts having a potential of 600 volts or less above ground. If the enclosure contains circuitry of higher potential, do not use this inspection guide.

2. Before inspecting trolley collectors and conductors, be sure that the power has been turned off and is tagged out, locked out as described in GS- 06.09.02-3.

3. Inspector needs to carefully inspect the trolley collector an conductor enclosure without creating a hazard to himself.

Inspection Actions

1. Open inspection panels or guards carefully and to the degree required for inspection.

2. Check trolley collectors for wear. Wheel-type collectors tend to wear at bushings.

3. Check conductors for wear and alignment.

4. Check insulators for cracks.

5. Tighten all bolts to manufacturer's recommended torque.

6. Check all electrical connections for tightness.

7. Remove all tools and inspection equipment before returning the trolley back to operation.

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 8 (Continued)

COMPONENT: POWER SUPPLY
CONTROL NUMBER: GS-II 06.09.08-8

Recommended Inspection Frequency

Do a Level II inspection each time a Level I inspection indicates one is required. During normal use, this level of inspection is required every six months.

References

1. ANSI Standard B30.2.0

2. Whiting Crane Handbook, Whiting Corporation, Harvey, IL

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 9

COMPONENT: SUPPORTING STRUCTURE
CONTROL NUMBER: GS-II 06.09.10-9

Application

This guide applies to the investigation of the alignment of hoist guide rails.

Special Safety Requirements

The following list of special safety requirements, beyond the requirements listed in the Master Safety Plan and System Safety Section, are to be observed in the performance of this inspection.

1. This inspection guide applies to hoist rails mounted at varying heights above the working floor. Follow all OSHA guidelines for safety straps to prevent falls and slips.

2. Notify the facility manager that the inspection is to be made.

3. Shut off power to all trolleys, cranes and runway and put your own padlocks on all electrical disconnects. Place "DO NOT OPERATE" tag on all disconnects. Use manufacturer's recommendation to properly lock out all electrical components.

4. Rope off area under hoist being inspected and post "WORKING OVERHEAD" signs.

5. Station a licensed operator in the cab or at the controls to move or operate the hoist if required during the inspection. Prior to operating it, the operator must determine that all persons are clear of moving components.

Inspection Actions

1. Measure the distance between rails to determine if they are within 1/8" or other tolerance prescribed by the manufacturer. Report any loose alignment bolts.

2. Visually inspect rail components for torqued members or deflections. By sighting along them or applying a straight-edge to verify their alignment.

3. Report all misaligned components to the facility manager. The crane should not be used until its' safety has been verified by a factory-authorized technician.

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 9 (Continued)

COMPONENT: SUPPORTING STRUCTURE
CONTROL NUMBER: GS-II 06.09.10-9

Inspection Actions (Continued)

4. Inspect connections to the building or bridge crane and rail support beams for tightness, damage or deflection.

5. Remove all lock-out, tag-out and safety equipment before notifying the facility manager that the inspection has been completed.

Recommended Inspection Frequency

Do a Level II inspection each time a Level I inspection indicates one is required. During normal use, this level of inspection is required every six months.

References

1. ANSI Standard B30.2.0

2. Whiting Crane Handbook, Whiting Corporation, Harvey, IL

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 1

COMPONENT: MOTOR AND WORKS HOUSING
CONTROL NUMBER: GS-III 06.09.01-1

Application

This guide applies to the investigation of electrical motors having excessive noise or vibration symptoms.

Special Safety Requirements

No special safety requirements are needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section.

Inspection Actions

1. Verify the findings of Level I inspection by using the vibration/sound level meter and measure the velocity (inches/second, peak), displacement (mils, peak-peak) and noise (db). Compare reading with acceptable manufacturer tolerances.
2. Inspect bearings for defects or dryness.
3. Inspect electrical motor and load unit for misalignment.
4. Inspect electrical motor and load unit for proper mounting.
5. Inspect electrical motor and load unit for transfer of vibration from another source.
6. Inspect coupling for loose connection.
7. If none of the above is the problem, reference manufacturer troubleshooting guide for additional inspections or repairs to be made.

Special Tools and Equipment

The following is a list of special tools required beyond those listed in the Standard Tool Section.

1. Vibration/sound level meter, IDR Mechanical #1TC87

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 1 (Continued)

COMPONENT: MOTOR AND WORKS HOUSING
CONTROL NUMBER: GS-III 06.09.01-1

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level I inspection.

References

1. KATO Engineering, Instruction Manual for Brushless Revolving Field Alternating Current Generators

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 2

COMPONENT: MOTOR AND WORKS HOUSING
CONTROL NUMBER: GS-III 06.09.01-2

Application

This guide applies to the investigation of excessive sparking at the collector rings, commutator or brushes.

Special Safety Requirements

No special safety requirements are needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section.

Inspection Actions

Level I Inspector will detect excessive sparking in the area of either the collector rings, commutator or brushes. Level III Inspector will perform the following tasks.

1. Verify that there is excessive sparking in the area of either the collector rings, commutator or brushes.

2. If there is a problem, stop the motor and evaluate the problems causing the sparking.

3. Classify the severity of the problem and recommend the procedure needed to correct the problem.

4. If the Level III Inspector can not evaluate the problem, recommend the next procedure required to further identify the correction procedure that needs to be followed.

Special Tools and Equipment

The following is a list of special tools required beyond those listed in the Standard Tool Section.

1. Wrenches

2. Feelers

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 2 (Continued)

COMPONENT: MOTOR AND WORKS HOUSING
CONTROL NUMBER: GS-III 06.09.01-2

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level I inspection.

References

1. "Handbook of Building and Plant Maintenance, Forms and Checklists" by Roger W. Liska and Judith Morrison Liska

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 3

COMPONENT: MOTOR AND WORKS HOUSING
CONTROL NUMBER: GS-III 06.09.01-3

Application

This guide applies to the investigation of a hot terminal or device that is overheating from the flow of current through that terminal or device.

Special Safety Requirements

No special safety requirements are needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section.

Inspection Actions

1. Verify the findings of Level I or II inspection by using the Infrared Scanner and measuring the temperatures of the device and terminals. If the device or terminals are not hot as indicated by the findings of Level II inspection, check the current flow through the device or terminals. Heat generated is proportionate to the square of the current. If there is little or no current flow through the device or terminal at the time of measurement, there will be no significant amount of heat generated.

2. For terminal connections, verify the type of conductor being terminated. If the conductor is an aluminum conductor, look for evidence of cold flow or melt down of conductor.

3. If there is evidence of cold flow or melt down of the aluminum conductor, the conductor should either be replaced or shortened and reconnected. When making new aluminum conductor terminations a joint compound should be used.

4. If the terminal is loose it should be tightened. De-energize prior to attempting tightening of terminal connections.

5. If none of the above is the problem than there is an internal problem and an on-site analysis must be made to determine if additional inspections are to be made or the unit is to be replaced.

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 3 (Continued)

COMPONENT: MOTOR AND WORKS HOUSING
CONTROL NUMBER: GS-III 06.09.01-3

Special Tools and Equipment

The following is a list of special tools required beyond those listed in the Standard Tool Section.

1. Infrared Scanner Raytek, Inc., #PM2EM-L2
2. Torque wrench
3. Digital Multimeter, Fluke #1TC676

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level I or II inspection.

References

1. Maintenance Technology/September 1993; Write-up Title: Infrared Keeps All Systems Go
2. Raining - Agema Infrared Systems; Measurement of Excess Temperatures with Infrared Scanners

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 4

COMPONENT: HOIST BRAKING SYSTEM
CONTROL NUMBER: GS-III 06.09.06-4

Application

This guide applies to the investigation of hoist braking systems.

Special Safety Requirements

The following list of special safety requirements, beyond the requirements listed in the Master Safety Plan and System Safety Section, are to be observed in the performance of this inspection.

1. This inspection guide applies to hoist mounted at varying heights above the working floor. Follow all OSHA guidelines for safety straps to prevent falls and slips.

2. Notify the facility manager that the inspection is to be made.

3. Shut off power to all hoists, cranes and runway and put your own padlocks on all crane disconnects. Place "DO NOT OPERATE" tag on all disconnects. Use manufacturer's recommendation to properly lock out the hoists.

4. Rope off area under hoist being inspected and post "WORKING OVERHEAD" signs.

Inspection Actions

Depending on safety requirements, hoists have two or more brakes. As a minimum, there is at least one control brake and one holding brake. Inspect each according to the manufacturer's special instructions to include as a minimum:

1. Check connection at coils.

2. Check lining wear and recommend replacement if worn to less than 1/16".

3. Check wheel for smoothness and concentricity.

4. Check wheel for tightness on shaft.

5. Check condition of pins, arms and springs and other brake parts for wear and alignment.

6. Check oil level for oil-immersed coils

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 4 (Continued)

COMPONENT: HOIST BRAKING SYSTEM
CONTROL NUMBER: GS-III 06.09.06-4

Special Tools and Equipment

The following is a list of special tools required beyond those listed in the Standard Tool Section.

1. Wrench set.

2. Gages.

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level I inspection. (Six months intervals but depending on crane usage.)

References

1. ANSI Standard B30.2.0

2. Whiting Crane Handbook, Whiting Corporation, Harvey, IL

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 5

COMPONENT: DRIVE ASSEMBLY
CONTROL NUMBER: GS-III 06.09.09-5

Application

This guide applies to the investigation of hoist trolley drive assemblies.

Special Safety Requirements

The following list of special safety requirements, beyond the requirements listed in the Master Safety Plan and System Safety Section, are to be observed in the performance of this inspection.

1. This inspection guide applies to hoists mounted at varying heights above the working floor. Follow all OSHA guidelines for safety straps to prevent falls and slips.

2. Notify the facility manager that the inspection is to be made.

3. Shut off power to all hoists, cranes and runway and put your own padlocks on all electrical disconnects. Place "DO NOT OPERATE" tag on all disconnects. Use manufacturer's recommendation to properly lock out the cranes.

4. Rope off area under hoist being inspected and post "WORKING OVERHEAD" signs.

Inspection Actions

1. Clean gear covers and open them being careful not to allow dirt to get into the gear units.

2. Visually check for excessive backlash, wear, or cracks in gears and pinions. Check for broken or worn bearings or misalignment.

3. Rotating gears slowly, check gear teeth for pitting on flanks and along pitchline, and for featheredges along the tips of teeth.

4. Check gear oil for level and metal shavings.

5. Check coupling for tight bolts, elongation of holes and tightness of keys in keyways.

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 5 (Continued)

COMPONENT: DRIVE ASSEMBLY
CONTROL NUMBER: GS-III 06.09.09-5

Special Tools and Equipment

The following is a list of special tools required beyond those listed in the Standard Tool Section.

1. Wrenches

2. Feeler gages

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level I inspection. (Usually 6-month interval)

References

1. ANSI Standard B30.2.0

2. Whiting Crane Handbook, Whiting Corporation, Harvey, IL

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 6

COMPONENT: DRIVE ASSEMBLY
CONTROL NUMBER: GS-III 06.09.09-6

Application

This guide applies to the investigation of hoist trolley braking systems.

Special Safety Requirements

The following list of special safety requirements, beyond the requirements listed in the Master Safety Plan and System Safety Section, are to be observed in the performance of this inspection.

1. This inspection guide applies to hoists mounted at varying heights above the working floor. Follow all OSHA guidelines for safety straps to prevent falls and slips.

2. Notify the facility manager that the inspection is to be made.

3. Shut off power to all hoists, cranes and runway and put your own padlocks on all crane disconnects. Place "DO NOT OPERATE" tag on all disconnects. Use manufacturer's recommendation to properly lock out the cranes.

4. Rope off area under hoist being inspected and post "WORKING OVERHEAD" signs.

Inspection Actions

1. Check connection at coils.

2. Check lining wear and recommend replacement if worn to less than 1/16".

3. Check wheel for smoothness and concentricity.

4. Check wheel for tightness on shaft.

5. Check condition of pins, arms and springs and other brake parts for wear and alignment.

6. Check oil level for oil-immersed coils

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 6 (Continued)

COMPONENT: DRIVE ASSEMBLY
CONTROL NUMBER: GS-III 06.09.09-6

Special Tools and Equipment

The following is a list of special tools required beyond those listed in the Standard Tool Section.

1. Wrench set.

2. Gages.

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level I inspection. (Six months intervals but depending on crane usage.)

References

1. ANSI Standard B30.2.0

2. Whiting Crane Handbook, Whiting Corporation, Harvey, IL

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 7

COMPONENT: MOTOR AND WORKS HOUSING
CONTROL NUMBER: GS-III 06.09.01-7

Application

This guide applies to the investigation of air motors having excessive noise symptoms.

Special Safety Requirements

No special safety requirements are needed for the performance of the Level III inspection beyond those required in the Master Safety Plan and System Safety Section.

Inspection Actions

1. Verify the findings of Level I inspection by using the vibration/sound level meter and measure the velocity (inches/second, peak), displacement (mils, peak-peak) and noise (db). Compare reading with acceptable manufacturer tolerances.

2. Inspect bearings for defects or dryness.

3. Inspect air motor and load unit for misalignment.

4. Inspect air motor and load unit for proper mounting.

5. Inspect coupling for loose connection.

6. If none of the above is the problem, reference manufacturer troubleshooting guide for additional inspections or repairs to be made.

Special Tools and Equipment

The following is a list of special tools required beyond those listed in the Standard Tool Section.

1. Vibration/sound level meter, IDR Mechanalysis #1TC87

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level I inspection.

References

1. KATO Engineering, Instruction Manual for Brushless Revolving Field Alternating Current Generators

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 8

COMPONENT: MOTOR AND WORKS HOUSING
CONTROL NUMBER: GS-III 06.09.01-8

Application

This guide applies to the investigation of air motors having excessive noise symptoms.

Special Safety Requirements

No special safety requirements are needed for the performance of the Level III inspection beyond those required in the Master Safety Plan and System Safety Section.

Inspection Actions

1. Verify the findings of Level I inspection by using the vibration/sound level meter and measure the velocity (inches/second, peak), displacement (mils, peak-peak) and noise (db). Compare reading with acceptable manufacturer tolerances.
2. Inspect bearings for defects or dryness.
3. Inspect air motor and load unit for misalignment.
4. Inspect air motor and load unit for proper mounting.
5. Inspect coupling for loose connection.
6. If none of the above is the problem, reference manufacturer troubleshooting guide for additional inspections or repairs to be made.

Special Tools and Equipment

The following is a list of special tools required beyond those listed in the Standard Tool Section.

1. Vibration/sound level meter, IDR Mechanalysis #1TC87

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level I inspection.

References

1. KATO Engineering, Instruction Manual for Brushless Revolving Field Alternating Current Generators

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 9

COMPONENT: CONTROLS
CONTROL NUMBER: GS-III 06.09.02-9

Application

This guide applies to the investigation of controls and radio control devices that do not operate properly.

Special Safety Requirements

No special safety requirements are needed for the performance of the Level III inspection beyond those required in the Master Safety Plan and System Safety Section.

Inspection Actions

1. Inspect the device in accordance with the manufacturer's operation and maintenance manual.

2. Engage the manufacturer's authorized maintenance service or other competent service organization to troubleshoot and repair the device.

Special Tools and Equipment

The following is a list of special tools are required beyond those listed in the Standard Tool Section.

1. Special tools as recommended by the device manufacturer.

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level II inspection.

References

1. Sverdrup Corporation

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 10

COMPONENT: HOIST BRAKING SYSTEM
CONTROL NUMBER: GS-III 06.09.06-10

Application

This guide applies to the investigation of a hoist braking system that is damaged or does not operate properly.

Special Safety Requirements

No special safety requirements are needed for the performance of the Level III inspection beyond those required in the Master Safety Plan and System Safety Section.

Inspection Actions

1. Inspect the device in accordance with the manufacturer's operation and maintenance manual.

2. Engage the manufacturer's authorized maintenance service or other competent service organization to troubleshoot and repair the device.

Special Tools and Equipment

The following is a list of special tools are required beyond those listed in the Standard Tool Section.

1. Special tools as recommended by the device manufacturer.

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level II inspection.

References

1. Sverdrup Corporation

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 11

COMPONENT: TROLLEY
CONTROL NUMBER: GS-III 06.09.07-11

Application

This guide applies to the investigation of trolleys having excessive noise symptoms.

Special Safety Requirements

No special safety requirements are needed for the performance of the Level III inspection beyond those required in the Master Safety Plan and System Safety Section.

Inspection Actions

1. Verify the findings of Level I inspection by using the vibration/sound level meter and measure the velocity (inches/second, peak), displacement (mils, peak-peak) and noise (db). Compare reading with acceptable manufacturer tolerances.

2. Inspect bearings for defects or dryness.

3. Inspect trolley for misalignment.

4. Inspect trolley for proper mounting.

5. Inspect trolley for loose connections.

6. If none of the above is the problem, reference manufacturer troubleshooting guide for additional inspections or repairs to be made.

Special Tools and Equipment

The following is a list of special tools required beyond those listed in the Standard Tool Section.

1. Vibration/sound level meter, IDR Mechanalysis #1TC87

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level I inspection.

References

1. KATO Engineering, Instruction Manual for Brushless Revolving Field Alternating Current Generators

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 12

COMPONENT: TROLLEY
CONTROL NUMBER: GS-III 06.09.07-12

Application

This guide applies to the investigation of a hoist trolley that is out of alignment.

Special Safety Requirements

No special safety requirements are needed for the performance of the Level III inspection beyond those required in the Master Safety Plan and System Safety Section.

Inspection Actions

1. Inspect the trolley in accordance with the manufacturer's operation and maintenance manual.

2. Engage the manufacturer's authorized maintenance service or other competent service organization to troubleshoot and repair the device.

Special Tools and Equipment

The following is a list of special tools are required beyond those listed in the Standard Tool Section.

1. Special tools as recommended by the device manufacturer.

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level I or II inspection.

References

1. Sverdrup Corporation

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 13

COMPONENT: SUPPORTING STRUCTURE
CONTROL NUMBER: GS-III 06.09.10-13

Application

This guide has been prepared to identify the purpose of a Level III inspection and its more sophisticated test and inspection methods which may be appropriate to determine the cause and/or extent of defects recorded in Level I or Level II defect observations at the supporting structure.

Whereas the purpose of the Level I inspection was to record the observable defects at the supporting structure, this Level III inspection is performed to provide a thorough systematic evaluation of the observed defect and to make an assessment of it's effects, if left unchecked, on the safety, durability and stability of the supporting structure and it's appurtenant works.

The Level III inspection should be performed when prompted by the results of a Level I or II inspection. The inspection should be performed by an engineer or multidisciplined team of engineers experienced in the design and construction of hoists.

The results of the Level III inspection will be used to develop maintenance or remedial measure work strategy that will correct the existing deficiency conditions or to require continued monitoring of existing deficiency conditions on the supporting structure.

In general, appropriate advanced inspection methods will be identified, recommended, and performed by or under the supervision of the inspection engineer personnel as part of the Level III test and inspection method. Advanced inspection methods will be assigned only after the assessment of defect conditions observed during a Level I or II inspection.

Special Safety Requirements

Level III inspection and testing must be performed with the prior approval of the Facility Manager who will provide personnel to barricade the area and provide other appropriate safety measures and safe access.

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 13 (Continued)

COMPONENT: SUPPORTING STRUCTURE
CONTROL NUMBER: GS-III 06.09.10-13

Inspection Action

1. Prior to making a field inspection of the observed defect, review all past records concerning the supporting structure and the defective component if available. These records may include pre-construction investigation records, design criteria and analysis records, available construction records, previous periodic maintenance inspection records and photographs taken during initial construction and subsequent inspections.

2. Perform inspection of the pertinent components where observed defects that triggered a Level III inspection are listed.

3. Make an assessment of the importance of individual defects observed for a given component at the hoist supporting structure site. Indicate priorities for any required maintenance, or remedial measure work.

4. Identify whether particular observed defects need additional or continued observation.

5. Assess the stability and safety of the supporting structure.

6. Prepare final cost estimate for advanced inspection methods required to determine the cause and extent of the observed defect.

7. Prepare cost estimate for required maintenance or remedial repair measures, as applicable.

Level III advanced inspection methods may be required for specific Level I and Level II defect conditions observed at a hoist supporting structure site. Level III advanced test or inspection methods and associated observed defects for the supporting structure include, but are not limited to the following:

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 13 (Continued)

COMPONENT: SUPPORTING STRUCTURE
CONTROL NUMBER: GS-III 06.09.10-13

	Advanced Test or Inspection Method	Applicable Observed Defects
1.	Grinding and or sandblasting, using caliper to measure section loss	corrosion of steel and section loss
2.	Magnetic particle	cracks in steel or welds
3.	Dye-Penetrant	cracks in steel or welds
3.	Ultrasonic test	cracks and voids in steel
4.	Survey measurements	member out-of-alignment

Special Instructions

Review as-built and design drawings of supporting structure.

Special Tools & Equipment Requirements

Grinder or sandblasting equipment
Surveying equipment
Industry required testing equipment needed to perform the advanced investigation method chosen

Recommended Inspection Frequency

As triggered by Level I and II defect/observations or every 3 years.

References

1. U.S. Department of transportation, Federal Highway Administration, Bureau of Public roads (DOT) Bridge Inspector's Training Manual, 1990 Edition

2. Bridge inspection and Rehabilitation, Parsons Brinckerhoff Edited by L.G. Silano, PE, 1993

3. Inspection of Bridges and Trestles NAVFAC MO-126, October 1991

4. AASHTO Manual for Maintenance Inspection of Bridges, American Association of State Highway and Transportation Officials

5. Micro Bridger (Version 1.0), U.S. Army Construction Engineering Research Laboratory

06.10 DUMBWAITERS

DESCRIPTION

Dumbwaiters provide a means for conveyance between building or structure elevations. They are primarily used for limited material transfer of small items. Dumbwaiters are limited in size to a maximum of 9 sq. ft. inside platform area and 4 ft. inside height. The system includes the dumbwaiter car, drive assembly, guide rails, hoistway doors, structural support, equipment controls and panels.

Dumbwaiter drive assemblies are of many different types that include: electric traction machine with counterweights, electric-motor driven including drum drive, chain drive, roped hydraulic, rack-and-pinion as well as screw drive. Traction and winding-drum types are the most common.

SPECIAL TOOL AND EQUIPMENT REQUIREMENTS

None.

SPECIAL SAFETY REQUIREMENTS

Follow applicable safety requirements set forth in the Master Safety Manual and the Elevator Industry Field Employees' Safety Handbook as augmented by local requirements if more stringent.

COMPONENT LIST

- 06.10.01 CAR INTERIOR
- 06.10.02 CAR DOORS/GATES
- 06.10.03 HOISTWAY DOORS
- 06.10.04 STRUCTURAL SUPPORTS
- 06.10.05 GUIDE RAILS
- 06.10.06 DRIVE ASSEMBLY
- 06.10.07 CONTROLS
- 06.10.08 MOTORS

RELATED SUBSYSTEMS

Due to the related nature of the elements requiring inspection, the following sections should be reviewed for relevant and concurrent inspection activities.

09.00	BUILDING FIRE PROTECTION
10.02	BUILDING ELECTRICAL (Low Voltage Dist. System 600 V or less)
10.03	LIGHTING
10.07	POWER SOURCES

06.10 DUMBWAITERS

STANDARD INSPECTION PROCEDURE

Prior to performing a Level I inspection, the inspector(s) should review existing records including as-built drawings, records of periodic inspection and maintenance logs. Since many dumbwaiters are maintained by service contract, it may be necessary to review contractual documentation to determine the scope of maintenance services provided from that source. Level I inspections for each dumbwaiter system will include operating the dumbwaiter, inspecting the related components at each floor level or landing, and inspecting the machine rooms. Some dumbwaiters may have additional remote control panels which have to be inspected as well.

For Level I observations, the inspector will not enter the hoistway or pit for safety reasons. No top-of car inspections will be made. In addition, extreme care has to be taken to remain clear of moving parts associated with these systems because of the random nature of dumbwaiter movement. No interlocks will be disabled. All dumbwaiters will remain in service. With the exception of using the keyed controls designed for dedicated service, no control sequences will be initiated except those available to normal users. Inspection requires one person making a visual examination and taking some measurements. The inspection shall be carried out on the basis of individual dumbwaiter installations as previously defined. Defects are to be recorded on the data collection device (DCD).

Level II inspections may require opening of doors and simple overrides of dumbwaiter interlocks. The inspector may make visual observations of the pit or hoistway and top and bottom of car without entering the pit or hoistway. Control cabinets may be opened in the machine room. The same safety concerns listed for Level I inspections apply to Level II inspections.

Dumbwaiter-related Level III inspections require a trained elevator technician and helper. The inspection procedures and safety guidelines to be used are found in the reference material listed at the end of this section. Additional Level III inspections may be required to evaluate defects in dumbwaiter-related components such as those included in the electrical or fire protection systems, for instance.

06.10 DUMBWAITERS

COMPONENTS

◆ 06.10.01 CAR INTERIOR

Standard car construction is either formed, reinforced and sound-deadened sheet metal with welded joints or metal-clad plywood with mechanically riveted or bolted joints. Exposed edges of plywood are covered with metal and with internal seams are sealed by soldering. Shelves, compartments, gates and other features may be included. The car may also be equipped with lighting.

Dumbwaiter cars generally have plain interior finishes. Stainless steel cladding may be required if the car is intended to carry prepared food, pharmaceuticals, hazardous materials or for other specialty applications.

Car Appearance and Fastenings: The car should be structurally sound. All finishes, including wall, doors, shelves, fixed or removable, and other hardware should be secure and not worn to the point of creating a hazard. Capacity plates and any additional data plates should be in place. Sagging floors, bowed panels, or separated joints are some indicators of structural damage or weakness.

Lighting: Light fixtures should be guarded from breakage and accidental contact.

Car Operation: Part of the dumbwaiter system evaluation is to move the car while observing the quality of its operation. Use visual observation, hearing, and even your sense of smell to evaluate the quality of performance. Usually adverse observations indicate problems with components outside of the car, including defective car alignment devices. Other observations relate directly to the car.

Leveling: The leveling action of the car should be observed at all landings. The approach to each landing should be tested in each direction. While car loading and load distribution can impact leveling accuracy, the car must meet leveling tolerances under all loading conditions. Frequent re-leveling, "hunting", overrun, or stopping the car out of tolerance from level is considered a defect. Specific conditions during the test should be recorded in the comments section to enable inspectors to duplicate the results at a later date.

06.10 DUMBWAITERS

COMPONENTS (Continued)

◆ 06.10.01 CAR INTERIOR (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Car Appearance and Fastenings:**			
Observation:			
a. Panels not secure. ***{Severity L}	EA		1
b. Shelves or other fixtures not secure. ***{Severity L}	EA		1
c. Car wall finish damaged. ***{Severity L}	SF		
d. Car ceiling finish damaged. ***{Severity L}	SF		
e. Car floor finish damaged. ***{Severity L}	SF		
f. Required signage missing. ***{Severity M}	EA		
g. Required capacity plate missing. ***{Severity M}	EA		
h. Evidence of structural damage/weakness. ***{Severity H}	EA		1

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Lighting:**			
Observation:			
a. Car lighting inadequate ***{Severity L}	EA		2
b. Car lights damaged ***{Severity M}	EA		2

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Car Operation:**			
Observation:			
a. Vertical vibration, jerk or bounce during start-up or stop. ***{Severity M}	EA		3
b. Horizontal vibration, front-to-back, side-to-side. ***{Severity M}	EA		3
c. Noise. ***{Severity M}	EA		3
d. Electrical/burning odors. ***{Severity M}	EA		3

06.10 DUMBWAITERS

COMPONENTS (Continued)

◆ 06.10.01 CAR INTERIOR (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Leveling:**			
Observation:			
a. Car fails to level within $\pm$ 1/2 inch. ***{Severity M}	EA		4
b. Cab overruns the stops. ***{Severity M}	EA		4
c. Cab "hunts" (jockeys at a floor). ***{Severity H}	EA		4

06.10 DUMBWAITERS

COMPONENTS (Continued)

◆ 06.10.02 CAR DOORS/GATES

Dumbwaiter car door/gates either a vertical-sliding, manually-operated gate or a power-operated, vertical biparting or slide-up gate, equipped with connecting linkages to operate the hoistway doors at each landing when car is present. Power-operated doors are highly desirable for large units and for frequently used units. Swinging doors are used for a large unit that is level with the floor, such as cart-handling units.

Door Operation: Dumbwaiter doors receive the heaviest use during normal operations. In addition to wear and alignment problems, proper door opening and closing sequences have to be checked.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Door Operation:**			
Observation:			
a. Door hangars loose, bent or damaged. ***{Severity M}	EA		5
b. Door motors worn/noisy. ***{Severity M}	EA		5
c. Door motor inoperable. ***{Severity M}	EA		5
d. Sills worn. ***{Severity M}	LF		5
e. Car door fails to respond to door controls. ***{Severity H}	EA		5
f. Door operation restricted. ***{Severity H}	EA		5
g. Car moves from the landing zone while door is not fully closed. ***{Severity H}	EA		5

06.10 DUMBWAITERS

COMPONENTS (Continued)

◆ 06.10.03 HOISTWAY DOORS

One hoistway door is provided at each opening service. They are either of the counterbalanced biparting type construction, counterbalanced vertical slide-up type or single-swing type construction. Normally, hoistway door panels and frame are constructed of not less than 16 gauge steel.

Door Operation: Opening the hoistway door must prevent the operation of the dumbwaiter car. Door must not open except when the car is at landing. Door must respond properly to the activation of controls.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Door Operation:**			
Observation:			
a. Loose or missing fasteners. ***{Severity M}	EA		6
b. Hoistway doors damaged. ***{Severity M}	EA		6
c. Hoistway door motors worn/noisy. ***{Severity M}	EA		6
d. Safety interlocks inoperable. ***{Severity H}	EA		6
e. Hoistway door motors inoperable. ***{Severity H}	EA		6
f. Hoistway doors inoperable. ***{Severity H}	EA		6

06.10 DUMBWAITERS

COMPONENTS (Continued)

◆ 06.10.04 STRUCTURAL SUPPORT

Normally, a rigidly braced structural steel tower extends the full height of the hoistway. The guide rails, hoistway doors and drive assembly are mounted to and supported by the steel tower. A semi-tower, located at each opening to support the hoistway door and guide rails, is also used.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
* **Physical Damage:**			
Observation:			
a. Fasteners loose or missing. ***{Severity M}	EA		7
b. Structure deformed or bent. ***{Severity M}	EA		7

Defect:

	UOM	LEVEL II KEY	LEVEL III KEY
* **Corrosion:**			
Observation:			
a. Surface corrosion (no pitting evident). ***{Severity L}	SF		7
b. Corrosion evidenced by pitting or blistering. ***{Severity M}	SF		7
c. Corrosion evidenced by holes or loss of base metal. ***{Severity H}	SF		7

06.10 DUMBWAITERS

COMPONENTS (Continued)

◆ 06.10.05 GUIDE RAILS

Guide rails are typically installed on one side or on both sides of the car and counterweight to control vertical alignment. They are normally bracket-mounted to the hoistway walls, cast iron nylon guide shoes gibbed and securely fastened to the car. Inspection will include wear, alignment and fastening.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
* **Guide Rail Damage:**			
Observation:			
a. Guide rails worn. ***{Severity H}	LF		8
b. Loose or missing fasteners. ***{Severity H}	EA		8
c. Guide rails out of alignment. ***{Severity H}	LF		8

06.10 DUMBWAITERS

COMPONENTS (Continued)

◆ 06.10.06 DRIVE ASSEMBLY

Drive assembly unit consists of drive motor with gear reducer, spring applied electrically-released brake with traction sheave and counterweight for traction machine or single drum mounted on the output shaft of the reducer for drum winding machine, all mounted on common steel base. Drive assembly may be located at the top or bottom of the hoistway and supported by hoistway walls.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Drive Assembly Inoperable:**			
Observation:			
a. Shaft locked.	EA		9
***{Severity M}			
b. Worn or damaged gears.	EA		9
***{Severity M}			
Defect:			
*** Sheave Damaged:**			
Observation:			
a. Worn unequally.	EA		9
***{Severity M}			
b. Broken, cracked.	EA		9
***{Severity H}			
Defect:			
*** Excessive Noise or Vibration:**			
Observation:			
a. Wear imbalance.	EA		9
***{Severity M}			
b. Misalignment.	EA		9
***{Severity M}			
Defect:			
*** Corrosion:**			
Observation:			
a. Surface corrosion (no pitting evident).	SF		9
***{Severity L}			
b. Corrosion evidenced by pitting or blistering.	SF		9
***{Severity M}			
c. Corrosion evidenced by holes or loss of base metal.	SF		9
***{Severity M}			

06.10 DUMBWAITERS

COMPONENTS (Continued)

◆ **06.10.06 DRIVE ASSEMBLY (Continued)**

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Defective Bearing:**			
Observation:			
a. Bearing is noisy (loose or damaged). ***{Severity M}	EA		9
b. Bearing runs hot (improperly lubricated). ***{Severity M}	EA		9

Defect:

*** Brake Drum Deficiencies:**			
Observation:			
a. Improper adjustment. ***{Severity L}	EA		9
b. Brake pads worn. ***{Severity M}	EA		9
c. Assembly damaged. ***{Severity H}	EA		9

Defect:

*** Cable/Counterweight Condition:**			
Observation:			
a. Counterweight guides/rollers worn. ***{Severity M}	EA		9
b. Compensator worn or damaged. ***{Severity M}	EA		9
c. Loose or missing fasteners. ***{Severity H}	EA		9
d. Excessive cable wear. ***{Severity H}	LF		9
e. Cable damaged/frayed/distorted ***{Severity H}	LF		9
f. Counterweight damaged. ***{Severity H}	EA		9

06.10 DUMBWAITERS

COMPONENTS (Continued)

◆ 06.10.07 CONTROLS

Control panels are provided at each landing site that the car can be dispatched to or from any landing. Standard fully automatic call and send control system panel includes call button, send button for each landing and illuminated "car-in-use" pilot light that flashes when car arrives at landing, door open, door closed where power operated doors are used. Master control stations are provided for each or group of dumbwaiters, including key switch and pilot lights for shut-down/start-up and emergency stop buttons.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Landing Controls:**			
Observation:			
a. Call button indicators will not light.	EA		10
***{Severity L}			
b. Pilot lights do not flash	EA		10
***{Severity L}			
c. Call buttons inoperable.	EA		10
***{Severity H}			
d. Door interlocks inoperable.	EA		10
***{Severity H}			

Defect:

*** Main Control:**			
Observation:			
a. Housing corroded.	EA		11
***{Severity M}			
b. Relays pitted or burned.	EA		11
***{Severity M}			
c. Units dirty.	EA		11
***{Severity M}			
d. Indications of overheating.	EA		11
***{Severity H}			
e. Wiring frayed or burned.	EA		11
***{Severity H}			
f. Emergency stop button inoperable.	EA		11
***{Severity H}			

06.10 DUMBWAITERS

COMPONENTS (Continued)

◆ 06.10.08 MOTORS

Dumbwaiters generally use AC power and are single-speed. They are generally located within the hoistway frame.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Corrosion:**			
Observation:			
a. Surface corrosion (no pitting evident). ***{Severity L}	SF		12
b. Corrosion evidenced by pitting or blistering. ***{Severity M}	SF		12
c. Corrosion evidenced by holes or loss of base metal. ***{Severity H}	SF		12

Defect:

*** Housekeeping:**			
Observation:			
a. Motor housings contaminated. ***{Severity L}	EA		12
b. Machine air passage dirty or clogged. ***{Severity M}	EA		12

Defect:

*** Structure:**			
Observation:			
a. Motor frame cracked or broken. ***{Severity M}	EA		12
b. Motor support cracked or broken. ***{Severity M}	EA		12
c. Motor support shifted. ***{Severity M}	EA		12
d. Defective mounting pads. ***{Severity M}	EA		12
e. Loose or missing mounting bolts. ***{Severity H}	EA		12

06.10 DUMBWAITERS

COMPONENTS (Continued)

◆ 06.10.08 MOTORS (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Motor Operation:**			
Observation:			
a. Excessively noisy.	EA		13
***{Severity L}			
b. Excessive vibration.	EA		13
***{Severity M}			
c. Excessive sparking at the collector rings, commutator, or brushes.	EA		14
***{Severity M}			

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Power Connections:**			
Observation:			
a. Terminal box cover missing.	EA		
***{Severity L}			
b. Insulation of motor leads damaged or deteriorated.	EA	1	
***{Severity M}			
c. Taping improperly installed or deteriorated.	EA	1	
***{Severity M}			
d. Unit not grounded.	EA	1	
***{Severity H}			

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Hot Spots:**			
Observation:			
a. Terminal 5° to 24°C above ambient.	EA	2	15
***{Severity M}			
b. Terminal 25° or more above ambient.	EA	2	15
***{Severity H}			

06.10 DUMBWAITERS

REFERENCES

1. Applicable jurisdictional regulations as required
2. ANSI/ASME A17.1 Safety Code for Elevators and Escalators, latest edition
3. ANSI/ASME A17.2 Inspectors' Manual for Elevators and Escalators, latest edition
4. Elevator Industry Field Employees' Safety Handbook, latest edition (Available from Elevator World, PO Box 6507, Mobile AL 36606)
5. Master Safety Manual, Fluor Daniel

06.10 DUMBWAITERS

LEVEL II KEY	GUIDE SHEET CONTROL NUMBER
1	GS-II 06.10.08-1
2	GS-II 06.10.08-2

LEVEL III KEY	GUIDE SHEET CONTROL NUMBER
1	GS-III 06.10.01-1
2	GS-III 06.10.01-2
3	GS-III 06.10.01-3
4	GS-III 06.10.01-4
5	GS-III 06.10.02-5
6	GS-III 06.10.03-6
7	GS-III 06.10.04-7
8	GS-III 06.10.05-8
9	GS-III 06.10.06-9
10	GS-III 06.10.07-10
11	GS-III 06.10.07-11
12	GS-III 06.10.08-12
13	GS-III 06.10.08-13
14	GS-III 06.10.08-14
15	GS-III 06.10.08-15

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 1

COMPONENT: MOTORS
CONTROL NUMBER: GS-II 06.10.08-1

Application

This guide applies to the investigation of the inside of an enclosure, containing bare, energized, electrical parts.

Special Safety Requirements

The following list of special safety requirements, beyond the requirements listed in the Master Safety Plan and System Safety Section, are to be observed in the performance of this inspection.

1. This inspection guide applies to enclosures containing live electrical parts having a potential of 600 volts or less above ground. If the enclosure contains circuitry of higher potential, do not use this inspection guide.

2. Any enclosure that is padlocked for safety reason is not to be opened unless okayed by the person having control of the key.

3. Inspector needs to carefully open, inspect the inside and close the enclosure without shutting down the equipment, and without creating a hazard to himself.

Inspection Actions

1. Open panels or doors carefully as required for doing the visual inspection.

2. Visually inspect for those physical damaged defects that are listed and tagged Level II Key No. as indicated above.

3. Close panels or doors carefully after the inspection is completed.

Recommended Inspection Frequency

Do a Level II inspection each time a Level I inspection indicates one is required.

References

1. Sverdrup Corporation

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 2

COMPONENT: MOTORS
CONTROL NUMBER: GS-II 06.10.08-2

Application

This guide applies to the investigation of the inside of an enclosure, containing bare, energized, electrical parts.

Special Safety Requirements

The following list of special safety requirements, beyond the requirements listed in the Master Safety Plan and System Safety Section, are to be observed in the performance of this inspection.

1. This inspection guide applies to enclosures containing live electrical parts having a potential of 600 volts or less above ground. If the enclosure contains circuitry of higher potential, do not use this inspection guide.

2. Any enclosure that is padlocked for safety reason is not to be opened unless okayed by the person having control of the key.

3. Inspector needs to carefully open, inspect the inside and close the enclosure without shutting down the equipment, and without creating a hazard to himself.

Inspection Actions

1. Open panels or doors carefully and to the degree required for scanning those devices being tested.

2. Make temperature measurements with an infrared scanner.

3. Measure the ambient temperature by measuring a spot on the inside of the enclosure that is least effected by any internal panel heat source.

4. Measure the temperature of the device specified.

5. Above ambient temperature is calculated by subtracting the ambient temperature from the device temperature.

6. Record the results.

7. Close panels or doors carefully after the inspection is complete.

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 2 (Continued)

COMPONENT: MOTORS
CONTROL NUMBER: GS-II 06.10.08-2

Recommended Inspection Frequency

Do a Level II inspection each time a Level I inspection is made.

References

1. Maintenance Technology/September 1993; Write-up Title: "Infrared Keeps All Systems Go"

2. Raining - Agema Infrared Systems; "Measurement of Excess Temperatures with Infrared Scanners"

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 1

COMPONENT: CAR INTERIOR
CONTROL NUMBER: GS-III 06.10.01-1

Application

This guide applies to the investigation of dumbwaiter cab appearance and condition as described in parts of ASME 17.2, Division 101.

Special Safety Requirements

Special safety requirements needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section are listed in Division 4 of the introduction of ASME 17.2 and the specific section of that publication referred to in the text of this guide sheet. Proper conduct of this inspection requires a trained elevator mechanic as outlined in QEI-1 Standard for the Qualification of Elevator Inspectors, as augmented by local code or regulation.

Inspection Actions

1. Verify the extent of inspections required in the reference sections listed above.
2. Inspect components and subcomponents according to the reference provided.
3. Report all deficiencies to the facility manager.

Special Tools and Equipment

Special tools required beyond those listed in the Standard Tool Section are at the discretion of the inspector. A guide list is found in Division 7 of the introduction to ASME 17.2.

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level I inspection.

References

1. ASME 17.2
2. QEI-1, Standard for the Qualification of Elevator Inspectors

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 2

COMPONENT: CAR INTERIOR
CONTROL NUMBER: GS-III 06.10.01-2

Application

This guide applies to the investigation of dumbwaiter cab lighting as described in ASME 17.2 Division 101, Item 101.1. Except that emergency lights are not required.

Special Safety Requirements

Special safety requirements needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section are listed in Division 4 of the introduction of ASME 17.2 and the specific section of that publication referred to in the text of this guide sheet. Proper conduct of this inspection requires a trained elevator mechanic as outlined in QEI-1 Standard for the Qualification of Elevator Inspectors, as augmented by local code or regulation.

Inspection Actions

1. Verify the extent of inspections required in the reference sections listed above.

2. Inspect components and subcomponents according to the reference provided.

3. Report all deficiencies to the facility manager.

Special Tools and Equipment

Special tools required beyond those listed in the Standard Tool Section are at the discretion of the inspector. A guide list is found in Division 7 of the introduction to ASME 17.2.

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level I inspection.

References

1. ASME 17.2

2. QEI-1, Standard for the Qualification of Elevator Inspectors

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 3

COMPONENT: CAR INTERIOR
CONTROL NUMBER: GS-III 06.10.01-3

Application

This guide applies to the investigation of dumbwaiter cab ride as described in ASME 17.2 and Elevator World's Guide to Elevatoring Section 7, pp 221-225.

Special Safety Requirements

Special safety requirements needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section are listed in Division 4 of the introduction of ASME 17.2 and the specific section of that publication referred to in the text of this guide sheet. Proper conduct of this inspection requires a trained elevator mechanic as outlined in QEI-1 Standard for the Qualification of Elevator Inspectors, as augmented by local code or regulation.

Inspection Actions

1. Verify the extent of inspections required in the reference sections listed above.
2. Inspect components and subcomponents according to the reference provided.
3. Report all deficiencies to the facility manager.

Special Tools and Equipment

Special tools required beyond those listed in the Standard Tool Section are at the discretion of the inspector. A guide list is found in Division 7 of the introduction to ASME 17.2.

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level I inspection.

References

1. ASME 17.2
2. QEI-1, Standard for the Qualification of Elevator Inspectors
3. Elevator World's Guide to Elevatoring Section 7

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 4

COMPONENT: CAR INTERIOR
CONTROL NUMBER: GS-III 06.10.01-4

Application

This guide applies to the investigation of dumbwaiter cab leveling accuracy as described in ASME 17,2 Divisions 100 and 103.

Special Safety Requirements

Special safety requirements needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section are listed in Division 4 of the introduction of ASME 17.2 and the specific section of that publication referred to in the text of this guide sheet. Proper conduct of this inspection requires a trained elevator mechanic as outlined in QEI-1 Standard for the Qualification of Elevator Inspectors, as augmented by local code or regulation.

Inspection Actions

1. Verify the extent of inspections required in the reference sections listed above.
2. Inspect components and subcomponents according to the reference provided.
3. Report all deficiencies to the facility manager.

Special Tools and Equipment

Special tools required beyond those listed in the Standard Tool Section are at the discretion of the inspector. A guide list is found in Division 7 of the introduction to ASME 17.2.

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level I inspection.

References

1. ASME 17.2
2. QEI-1, Standard for the Qualification of Elevator Inspectors

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 5

COMPONENT: CAR DOORS/GATES
CONTROL NUMBER: GS-III 06.10.02-5

Application

This guide applies to the investigation of dumbwaiter cab door operation as described in ASME 17.2 Divisions 100 and 101.

Special Safety Requirements

Special safety requirements needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section are listed in Division 4 of the introduction of ASME 17.2 and the specific section of that publication referred to in the text of this guide sheet. Proper conduct of this inspection requires a trained elevator mechanic as outlined in QEI-1 Standard for the Qualification of Elevator Inspectors, as augmented by local code or regulation.

Inspection Actions

1. Verify the extent of inspections required in the reference sections listed above.
2. Inspect components and subcomponents according to the reference provided.
3. Report all deficiencies to the facility manager.

Special Tools and Equipment

Special tools required beyond those listed in the Standard Tool Section are at the discretion of the inspector. A guide list is found in Division 7 of the introduction to ASME 17.2.

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level I inspection.

References

1. ASME 17.2
2. QEI-1, Standard for the Qualification of Elevator Inspectors

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 6

COMPONENT: HOISTWAY DOORS
CONTROL NUMBER: GS-III 06.10.03-6

Application

This guide applies to the investigation of hoistway doors as described in ASME 17.2, Division 103.

Special Safety Requirements

Special safety requirements needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section are listed in Division 4 of the introduction of ASME 17.2 and the specific section of that publication referred to in the text of this guide sheet. Proper conduct of this inspection requires a trained elevator mechanic as outlined in QEI-1 Standard for the Qualification of Elevator Inspectors, as augmented by local code or regulation.

Inspection Actions

1. Verify the extent of inspections required in the reference sections listed above.
2. Inspect components and subcomponents according to the reference provided.
3. Report all deficiencies to the facility manager.

Special Tools and Equipment

Special tools required beyond those listed in the Standard Tool Section are at the discretion of the inspector. A guide list is found in Division 7 of the introduction to ASME 17.2.

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level I inspection.

References

1. ASME 17.2
2. QEI-1, Standard for the Qualification of Elevator Inspectors

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 7

COMPONENT: STRUCTURAL SUPPORTS
CONTROL NUMBER: GS-III 06.10.04-7

Application

This guide applies to the investigation of structural supports as described in ASME 17.2, Division 103.

Special Safety Requirements

Special safety requirements needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section are listed in Division 4 of the introduction of ASME 17.2 and the specific section of that publication referred to in the text of this guide sheet. Proper conduct of this inspection requires a trained elevator mechanic as outlined in QEI-1 Standard for the Qualification of Elevator Inspectors, as augmented by local code or regulation.

Inspection Actions

1. Verify the extent of inspections required in the reference sections listed above.

2. Inspect components and subcomponents according to the reference provided.

3. Report all deficiencies to the facility manager.

Special Tools and Equipment

Special tools required beyond those listed in the Standard Tool Section are at the discretion of the inspector. A guide list is found in Division 7 of the introduction to ASME 17.2.

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level I inspection.

References

1. ASME 17.2

2. QEI-1, Standard for the Qualification of Elevator Inspectors

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 8

COMPONENT: GUIDE RAILS
CONTROL NUMBER: GS-III 06.10.05-8

Application

This guide applies to the investigation of hoistway guide rails as described in ASME 17.2, Division 103.

Special Safety Requirements

Special safety requirements needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section are listed in Division 4 of the introduction of ASME 17.2 and the specific section of that publication referred to in the text of this guide sheet. Proper conduct of this inspection requires a trained elevator mechanic as outlined in QEI-1 Standard for the Qualification of Elevator Inspectors, as augmented by local code or regulation.

Inspection Actions

1. Verify the extent of inspections required in the reference sections listed above.
2. Inspect components and subcomponents according to the reference provided.
3. Report all deficiencies to the facility manager.

Special Tools and Equipment

Special tools required beyond those listed in the Standard Tool Section are at the discretion of the inspector. A guide list is found in Division 7 of the introduction to ASME 17.2.

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level I inspection.

References

1. ASME 17.2
2. QEI-1, Standard for the Qualification of Elevator Inspectors

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 9

COMPONENT: DRIVE ASSEMBLY
CONTROL NUMBER: GS-III 06.10.06-9

Application

This guide applies to the investigation of all dumbwaiter drive assembly subcomponents as described in ASME 17.2 Division 104.

Special Safety Requirements

Special safety requirements needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section are listed in Division 4 of the introduction of ASME 17.2 and the specific section of that publication referred to in the text of this guide sheet. Proper conduct of this inspection requires a trained elevator mechanic as outlined in QEI-1 Standard for the Qualification of Elevator Inspectors, as augmented by local code or regulation.

Inspection Actions

1. Verify the extent of inspections required in the reference sections listed above.
2. Inspect components and subcomponents according to the reference provided.
3. Report all deficiencies to the facility manager.

Special Tools and Equipment

Special tools required beyond those listed in the Standard Tool Section are at the discretion of the inspector. A guide list is found in Division 7 of the introduction to ASME 17.2.

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level I inspection.

References

1. ASME 17.2
2. QEI-1, Standard for the Qualification of Elevator Inspectors

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 10

COMPONENT: CONTROLS
CONTROL NUMBER: GS-III 06.10.07-10

Application

This guide applies to the investigation of dumbwaiter service-level controls as described in parts of ASME 17.2 Divisions 100, 102, and 103.

Special Safety Requirements

Special safety requirements needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section are listed in Division 4 of the introduction of ASME 17.2 and the specific section of that publication referred to in the text of this guide sheet. Proper conduct of this inspection requires a trained elevator mechanic as outlined in QEI-1 Standard for the Qualification of Elevator Inspectors, as augmented by local code or regulation.

Inspection Actions

1. Verify the extent of inspections required in the reference sections listed above.

2. Inspect components and subcomponents according to the reference provided.

3. Report all deficiencies to the facility manager.

Special Tools and Equipment

Special tools required beyond those listed in the Standard Tool Section are at the discretion of the inspector. A guide list is found in Division 7 of the introduction to ASME 17.2.

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level I inspection.

References

1. ASME 17.2

2. QEI-1, Standard for the Qualification of Elevator Inspectors

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 11

COMPONENT: CONTROLS
CONTROL NUMBER: GS-III 06.10.07-11

Application

This guide applies to the investigation of main dumbwaiter control panels as described in parts of ASME 17.2, Division 104.

Special Safety Requirements

Special safety requirements needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section are listed in Division 4 of the introduction of ASME 17.2 and the specific section of that publication referred to in the text of this guide sheet. Proper conduct of this inspection requires a trained elevator mechanic as outlined in QEI-1 Standard for the Qualification of Elevator Inspectors, as augmented by local code or regulation.

Inspection Actions

1. Verify the extent of inspections required in the reference sections listed above.

2. Inspect components and subcomponents according to the reference provided.

3. Report all deficiencies to the facility manager.

Special Tools and Equipment

Special tools required beyond those listed in the Standard Tool Section are at the discretion of the inspector. A guide list is found in Division 7 of the introduction to ASME 17.2.

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level I inspection.

References

1. ASME 17.2

2. QEI-1, Standard for the Qualification of Elevator Inspectors

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 12

COMPONENT: MOTORS
CONTROL NUMBER: GS-III 06.10.08-12

Application

This guide applies to the investigation of motors as described in ASME 17.2, Division 104.

Special Safety Requirements

Special safety requirements needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section are listed in Division 4 of the introduction of ASME 17.2 and the specific section of that publication referred to in the text of this guide sheet. Proper conduct of this inspection requires a trained elevator mechanic as outlined in QEI-1 Standard for the Qualification of Elevator Inspectors, as augmented by local code or regulation.

Inspection Actions

1. Verify the extent of inspections required in the reference sections listed above.
2. Inspect components and subcomponents according to the reference provided.
3. Report all deficiencies to the facility manager.

Special Tools and Equipment

Special tools required beyond those listed in the Standard Tool Section are at the discretion of the inspector. A guide list is found in Division 7 of the introduction to ASME 17.2.

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level I inspection.

References

1. ASME 17.2
2. QEI-1, Standard for the Qualification of Elevator Inspectors

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 13

COMPONENT: MOTORS
CONTROL NUMBER: GS-III 06.10.08-13

Application

This guide applies to the investigation of electrical motors having excessive noise or vibration symptoms.

Special Safety Requirements

No special safety requirements are needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section.

Inspection Actions

1. Verify the findings of Level I inspection by using the vibration/sound level meter and measure the velocity (inches/second, peak), displacement (mils, peak-peak) and noise (db). Compare reading with acceptable manufacturer tolerances.
2. Inspect bearings for defects or dryness.
3. Inspect electrical motor and load unit for misalignment.
4. Inspect electrical motor and load unit for proper mounting.
5. Inspect electrical motor and load unit for transfer of vibration from another source.
6. Inspect coupling for loose connection.
7. If none of the above is the problem, reference manufacturer troubleshooting guide for additional inspections or repairs to be made.

Special Tools and Equipment

The following is a list of special tools required beyond those listed in the Standard Tool Section.

1. Vibration/sound level meter, IDR Mechanalysis #ITC87

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 13 (Continued)

COMPONENT: MOTORS
CONTROL NUMBER: GS-III 06.10.08-13

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level I inspection.

References

1. KATO Engineering, Instruction Manual for Brushless Revolving Field Alternating Current Generators

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 14

COMPONENT: MOTORS
CONTROL NUMBER: GS-III 06.10.08-14

Application

This guide applies to the investigation of excessive sparking at the collector rings, commutator or brushes.

Special Safety Requirements

No special safety requirements are needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section.

Inspection Actions

Level I Inspector will detect excessive sparking in the area of either the collector rings, commutator or brushes. Level III Inspector will perform the following tasks.

1. Verify that there is excessive sparking in the area of either the collector rings, commutator or brushes.

2. If there is a problem, stop the motor and evaluate the problems causing the sparking.

3. Classify the severity of the problem and recommend the procedure needed to correct the problem.

4. If the Level III Inspector can not evaluate the problem, recommend the next procedure required to further identify the correction procedure that needs to be followed.

Special Tools and Equipment

The following is a list of special tools required beyond those listed in the Standard Tool Section.

1. Wrenches

2. Feelers

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 14 (Continued)

COMPONENT: MOTORS
CONTROL NUMBER: GS-III 06.10.08-14

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level I inspection.

References

1. "Handbook of Building and Plant Maintenance, Forms and Checklists" by Roger W. Liska and Judith Morrison Liska

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 15

COMPONENT: MOTORS
CONTROL NUMBER: GS-III 06.10.08-15

Application

This guide applies to the investigation of a hot terminal or device that is overheating from the flow of current through that terminal or device.

Special Safety Requirements

No special safety requirements are needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section.

Inspection Actions

1. Verify the findings of Level II inspection by using the Infrared Scanner and measuring the temperatures of the device and terminals. If the device or terminals are not hot as indicated by the findings of Level II inspection, check the current flow through the device or terminals. Heat generated is proportionate to the square of the current. If there is little or no current flow through the device or terminal at the time of measurement, there will be no significant amount of heat generated.

2. For terminal connections, verify the type of conductor being terminated. If the conductor is an aluminum conductor, look for evidence of cold flow or melt down of conductor.

3. If there is evidence of cold flow or melt down of the aluminum conductor, the conductor should either be replaced or shortened and reconnected. When making new aluminum conductor terminations a joint compound should be used.

4. If the terminal is loose it should be tightened. De-energize prior to attempting tightening of terminal connections.

5. If none of the above is the problem than there is an internal problem and an on-site analysis must be made to determine if additional inspections are to be made or the unit is to be replaced.

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 15 (Continued)

COMPONENT: MOTORS
CONTROL NUMBER: GS-III 06.10.08-15

Special Tools and Equipment

The following is a list of special tools required beyond those listed in the Standard Tool Section.

1. Infrared Scanner (Raytek, Inc., #PM2EM-L2
2. Torque wrench
3. Digital Multimeter, Fluke #1TC676

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level II inspection.

References

1. Maintenance Technology/September 1993; Write-up Title: Infrared Keeps All Systems Go
2. Raining - Agema Infrared Systems; Measurement of Excess Temperatures with Infrared Scanners

APPENDIX A

ABBREVIATIONS

Amb.	Ambient
Amp	Ampere
ANSI	American National Standards Institute
BLDG	Building
°C	Degrees Celsius (Centigrade)
CAIS	Condition Assessment Information Survey
CAP	Capacity
CAS	Condition Assessment Survey
CEMA	Conveyor Equipment Manufacturers Association
COMPL	Complete
DAMA	Damaged
dB	Decibels
DCD	Data Collection Device
Dia.	Diameter
DOD	U.S.Department of Defense
EA	Each
Elect.	Electrical
e.g.	For example
Ft.	Feet
GS-II	Guide Sheet, Level II Inspection Method
GS-III	Guide Sheet, Level III Inspection Method
H	High
HP	Horsepower

APPENDIX A

HR	Hour
in.	Inches
IU	Inspection Unit
L	Low
LF	Linear Feet
M	Medium
Mils	1/1000 inch
mm	Millimeters
Mngr's	Manager's
MTR	Motor
NAVFAC	Naval Facilities Engineering Command
NEMA	National Electrical Manufacturers Association
No.	Number
OSHA	U.S. Occupational Safety and Health Administration
PE	Professional Engineer
PWR	Power
Re-bars	Reinforcing bars
Req'd	Required
REPL	Replace
SF	Square Feet
STRU	Structure
Temp.	Temperature
UOM	Unit of Measure
US	United States

APPENDIX A

UT	Unit
V	Volts
W	Wide
WBS	Work Breakdown Structure
YRS	Years
<	Less than
>	Greater than
'	Foot or Feet
"	Inch or Inches
/	And
°C	Degrees Celsius (Centigrade)

APPENDIX B

GLOSSARY

Alignment	The position of parts, or components, in relation to each other.
Ambient	An encompassing atmosphere - existing or present on all sides.
Anchor Bolt	Bolts used for fastening the conveyor or other equipment to the floor, pit, or other foundation, or to ceiling or overhead structure when the conveyor is suspended.
Anomaly	Deviation from the common rule, something different, abnormal, peculiar, not easily classified.
Automatic	Self-acting and/or self-regulating mechanism that performs a predetermined function. The term automatic is frequently misused to imply some degree of control sophistication or automation. Specific description of the intended automatic function is necessary for a proper understanding.
Automatic Take-up	A take-up having provisions which permit it to automatically compensate for stretch, shrink or wear of belts, cables, chains, etc., and to maintain proper tensions.
Axle	A shaft, either rotating or non-rotating on which are mounted driving or supporting wheels or rollers.
Balustrade	A low parapet or banister topped by a handrail.
Bearing	A machine part in or on which a journal, shaft, axle, pin, or other part rotates, oscillates or slides.
Belt Carcass	The belt carcass is the tension element of a conveyor belt. It is the primary reinforcement for belt tear resistance, load support, and mechanical fastener-holding ability. Most conveyor belt carcasses are made of one or more plies of woven fabric. Some high-tension carcasses employ a single layer of parallel steel cables.
Belt Coating (lagging)	A smooth or embossed covering or lagging applied to a conveyor belt to protect the belt from the weather or the conveyed product or to increase friction between the belt and the drive pulley or the conveyed product.
Belt Conveyor	An endless fabric, rubber, plastic, leather, or metal belt operating over suitable drive, tail end and bend terminals and over belt idlers or slider bed for handling bulk materials, packages, or objects placed directly upon the belt.

APPENDIX B

Blower	A fan which operates where the resistance to gas flow is predominately downstream of the fan.
Brake	A device for slowing down conveyor components; for bringing conveyor equipment to a controlled stop; for holding traveling or traversing equipment in a selected location; for preventing reverse travel; or for controlling overspeed due to the action of gravity.
Carrying Roller (Idler)	The conveyor roller upon which the conveyor belt or the object being transported is supported.
Chain	A series of links pivotally joined together to form a medium for conveying or transmitting motion or power. General classes of chain common to the conveyor art are: detachable, pintle, combination, roller, rivetless, coil, inverted tooth, and bar link chains.
Chain Drive	A power transmission device employing a drive chain and sprockets.
Coated (Lagged) Pulley	A pulley covered with a smooth or embossed material, usually resilient, to reduce wear on the pulley face, effect a self-cleaning action on the pulley surface, or increase the coefficient of friction between the pulley and the belt.
Coefficient of Friction	A numerical expression of the ratio between the force of contact existing between two surfaces and the resistant force tending to oppose the motion of one with respect to the other. The coefficient of friction is used in determining the power necessary to drive a machine; to determine the slope angles used in hoppers, bins, chutes, and bunkers; or to determine the maximum angle of inclination for a conveyor.
Comb Plate	A plate with teeth similar to those of a comb. On escalators or moving walks, the threshold or floor plate immediately adjacent to the opening where the steps, pallets, or belt emerge from or enter the machine space at either end of the unit. The teeth of the comb plate mesh with similar teeth or grooves and ridges in the steps or belt.
Conveyor Belt	A belt used to carry materials and transmit the power required to move the load being conveyed.
Conveyor Housing	An independent enclosure designed to protect the complete conveyor.
Corrosion	The general disintegration and wasting of surface metal or other material through oxidation, decomposition, temperature, and other natural agencies.

APPENDIX B

Counterweighted Take-up	A take-up mechanism where the adjustment is made automatically by the potential energy in weights.
Drive	An assembly of the necessary structural, mechanical and electrical parts which provide the motive power for a conveyor.
Drive Belt	A belt which is used to transmit power or motion from one part to another.
Drive Chain	A chain used to transmit power.
Drive Pulley	A pulley mounted on the drive shaft that transmits power to the belt with which it is in contact.
Dumbwaiter	A hoisting or lowering mechanism with a car of limited capacity and size which moves in guides in a substantially vertical direction and is used exclusively for carrying material.
Elevator	A hoisting and lowering mechanism equipped with a car or platform which moves in guides in a substantially vertical direction, and which serves two or more floors of a building or structure.
Escalator	A power-driven, inclined, continuous stairway used for raising or lowering passengers.
Elastomer	A natural or synthetic rubber-like material.
Expansion Joint	A joint construction arranged to permit sliding of joining members, yet providing continuity of support. Its purpose is to accommodate change in length caused by expansion or contraction.
Frame	The structure which supports the machinery components of a conveyor.
Gearmotor	A motor and speed reducer combination where the two units are flanged for connection to each other and have one output shaft; or where the two units are closely coupled with the motor resting on a base which is an integral part of the speed reducer housing.
Gear Reducer	A power transmission mechanism designed to provide a speed for the driven equipment less than that of the prime mover. They may be either constant speed or adjustable speed. They are generally totally enclosed to retain lubricant and prevent the entry of foreign material.
Gib	A plate of metal or other material machined to hold other parts in place, to afford a bearing surface, or to provide a means of overcoming looseness.

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Gravity Take-up	See Counterweighted Take-Up.
Guard	A covering or barricade provided for safety purposes such as gear, chain, and coupling guards. It may also consist of protective devices provided in the proximity of a hazardous condition for protection of equipment or personnel.
Handrail	Any safety railing for protection of personnel.
Head Pulley	The pulley at the head or delivery end of the conveyor.
Hydraulic Take-up	An automatic take-up mechanism where tension is maintained by the use of hydraulic cylinders.
Lagging	A smooth or embossed covering or coating applied to a pulley to reduce belt slippage, wear, and prevent material build-up.
Lagged Pulley	A pulley having the surface of its face covered with lagging.
Lubricator, automatic	A device used to automatically lubricate the chain, trolley wheels or other conveyor components.
Maintenance	Upkeep of the property or equipment including regular programmed inspection, lubrication, adjustment, and repair or replacement of working parts as required.
Pitting	Development of relatively small cavities in a surface; in concrete, localized disintegration, such as a popout; in steel, localized corrosion evident as minute cavities on the surface.
Pneumatic Take-up	An automatic take-up in which tension is maintained by the use of air cylinders.
Return Belt	The belt, strand, or run return to the loading point.
Return Roller (Idler)	An idler or roller supporting the return run of the belt.
Roller	(1) A round part free to revolve about its outer surface. The face may be straight, tapered, crowned, concave or flanged, corrugated, ribbed or fluted; (2) The rotating element upon which a conveyor belt or chain or the object being transported is carried.
Rough Top Belt	A belt cover intentionally made with irregular ridges or projections to produce a broken surface for greater traction or carrying abilities. Used for inclined service.

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Screw Take-up	(1) A take-up in which movement of the bearing block is accomplished by means of a screw; (2) A take-up assembly having provision for manual adjustment by one or more screws to compensate for stretch, shrink, or wear of a conveying or power transmission medium
Sheave	A wheel with a grooved rim used with ropes, cables, chains, belts, etc.
Slide Gate	A type of gate or valve in which the gate plate slides in guides.
Slider Bed	A stationary surface on which the carrying run of a belt conveyor slides.
Snub Roller (Idler)	Any roller used to increase the arc of contact between a belt and drive or tail pulley.
Splice (Belt)	A joint or junction made by lapping or butting, straight or on a bias, and held together through vulcanization or mechanical means.
Spring Take-up	A take-up mechanism where adjustments are made automatically by the potential energy of springs.
Sprocket	A wheel with suitable shaped and spaced cogs or teeth to engage with the links of a chain.
Stretch	The temporary change in length of a conveying medium such as belt, chain, or cable. Stretch varies directly with tension in the conveying media. Stretch is usually measured as a percentage of length and is a function of the working load, environmental and ambient conditions.
Tail Pulley	A pulley mounted at the tail or loading end of a conveyor.
Take-up Device	The assembly of the necessary structural and mechanical parts which provides the means to adjust the length of belts, cables, chains, etc., to compensate for stretch, shrinkage, or wear and to maintain proper tension.
Take-up Pulley	A pulley mounted on the take-up shaft of a take-up device.
Tension	The actual pull (force) existing at any point in the belt or chain.
Threshold Plate	The metal or composition plate covering the machine or access space at either end of an escalator or moving walk.

APPENDIX B

Truss	A jointed structure made up of individual members arranged and connected, usually in a triangular pattern, so as to support longer spans.
Valve	A device or structure through which material is permitted to pass. The flow may be stopped or regulated by means of a gate.
V-belt	A belt with a trapezoidal cross section for operation in grooved sheaves permitting wedging contact between the belt sides and groove sides for power transmission.
Weathering	The effects caused by light, water, and heat.
Weld	A joint between pieces of metal at faces which have been made plastic by heat or pressure.
Wheel	A disc or circular frame which may be solid, built-up, or formed and which is capable of turning on, or with a central axis.

APPENDIX C

LIFE CYCLES

06 BUILDING CONVEYING SYSTEMS

06.01 HYDRAULIC ELEVATORS

Hydraulic elevators	20 YRS

Source:
Volume 7 DOE Condition Assessment Survey Program

06.02 TRACTION ELEVATORS

Traction elevators	20 YRS

Source:
Volume 7 DOE Condition Assessment Survey Program

06.03 ESCALATOR

Escalators	30 YRS

Source:
Dover Elevator Corporation and Schindler Elevator Corporation

06.04 PNEUMATIC TUBE ASSEMBLY

Pneumatic Conveying System	15 to 20 YRS

Source:
TransLogic Corporation

06.05 MOVING WALKS

Moving Walk	30 YRS
Belt	10 to 15 YRS

Source:
Montgomery Elevator Company
Schindler Elevator Corporation
Westmont Industries

APPENDIX C

06.06 CONVEYOR

Conveyor	10 YRS
Belt	5 YRS

Source:
Rapistan Corporation

06.07 BRIDGE CRANE

Bridge Cranes	50 YRS

Source:
Industry experience, interview with Whiting Corporation Engineers

06.08 CHUTES

Chutes	30 to 50 YRS

Source:
Comparison to building components from the DOE Condition Assessment Program

06.09 HOISTS

Hoists	25 YRS

Source:
Budget-Shaw Box Inc., Lift Tech International

06.10 DUMBWAITERS

Dumbwaiters	20 YRS

Source:
Dover Elevator, St. Louis Office, and Shindler Elevator Corporation